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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 159836

2. To: (Receiving Organization) Those Listed	3. From: (Originating Organization) M.J. Hartman -- Geosciences	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Environmental	6. Cog. Engr.: B.A. Williams 6/30/92	7. Purchase Order No.: N/A
8. Originator Remarks: Please review the attached borehole completion data package. Address comments to M.J. Hartman, H4-56, 6-9924.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: May 6, 1992

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-EN-DP-040		0	Borehole Completion Data Package for Wells N-71, N-72, N-73, N-74	3Q	4/1		

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

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1	1	Cog.Eng. B.A. Williams		6/30/92	H4-56	EDMC (2)			H4-22	3	
1	1	Cog. ~~Mgr. A.J. Knepp~~		6/30/92	H4-56	IRA Clearance			H4-17	3	
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30 Jun 92 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	Cognizant/Project Engineer's Manager 6/30/92 Date	Ltr. No. N/A [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

BD-7400-172-1 (02/89)

SUPPORTING DOCUMENT

1. Total Pages 264

2. Title

Borehole Completion Data Package for Wells 199-N-71, 199-N-72, 199-N-73, and 199-N-74

3. Number

WHC-SD-EN-DP-040

4. Rev No.

0

5. Key Words

BOREHOLE COMPLETION; MONITORING WELLS; 100-N AREA; GROUNDWATER MONITORING

APPROVED FOR PUBLIC RELEASE

6. Author

Name: M.J. Hartman

Signature

Organization/Charge Code 81231 /R31GA

7/2/92 N. Solis

7. Abstract

Wells N-71 through N-74 were drilled in 1991 as RCRA groundwater monitoring wells in the 100-N Area of the Hanford Site. The data package includes information on drilling, construction, development, and aquifer testing. Data interpretation is limited to aquifer testing and depths of the Hanford/Ringold contact.

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Author/Requestor (Printed/Signature): M. J. Hartman — Date: 6/30/92

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TABLE

1 Survey Data for Groundwater Monitoring Wells Installed in the 100-N Area in 1991 3

1.0 INTRODUCTION

Four new groundwater monitoring wells were installed in the 100-N Area during 1991 in support of the *Hanford Federal Facility Agreement and Consent Order* (Ecology 1991), Tri-Party Agreement milestone M-24-17. Well 199-N-74 will serve as an upgradient monitoring well for the 1325-N Liquid Waste Disposal Facility. Well 199-N-71 is an upgradient well for the 1324-N/NA facilities. Wells 199-N-72 and 199-N-73 are downgradient wells for the 1324-N/NA facilities. The locations of these wells are illustrated in Figure 1. Coordinates and elevations are listed in Table 1. For convenience, well numbers are often shortened by dropping the "199-" prefix.

The groundwater monitoring plan for the 100-N *Resource Conservation and Recovery Act of 1976* (RCRA) sites (Hartman 1991) describes the hydrogeology of the 100-N Area, and provides justification for the new wells and their locations. The wells were constructed to the specifications described in WHC (1990).

This document is a compilation of data and information on drilling, construction, and development of the new wells. Copies of forms, notes, and diagrams completed in the field comprise the bulk of this document. Few interpretations are included. Lithologic contacts were picked by Dr. K.A. Lindsey, based on the geologist's logs. Aquifer test data were interpreted to estimate aquifer properties.

For each well, the following documents are included in appendices:

- Appendix A
  - Well summary sheet
  - Well construction report
  - Borehole log
  - Geophysical log(s)
- Appendix B
  - Grain size data for screened interval
  - $CaCO_3$ and moisture data
- Appendix C
  - Well development record
  - Pump installation record
- Appendix D
  - Drawdown and recovery data
  - Slug test data
  - Aquifer test analysis.

Other records, such as chain of custody forms, decontamination records, daily field records, and training records are on file with Westinghouse Hanford Company (Westinghouse Hanford).

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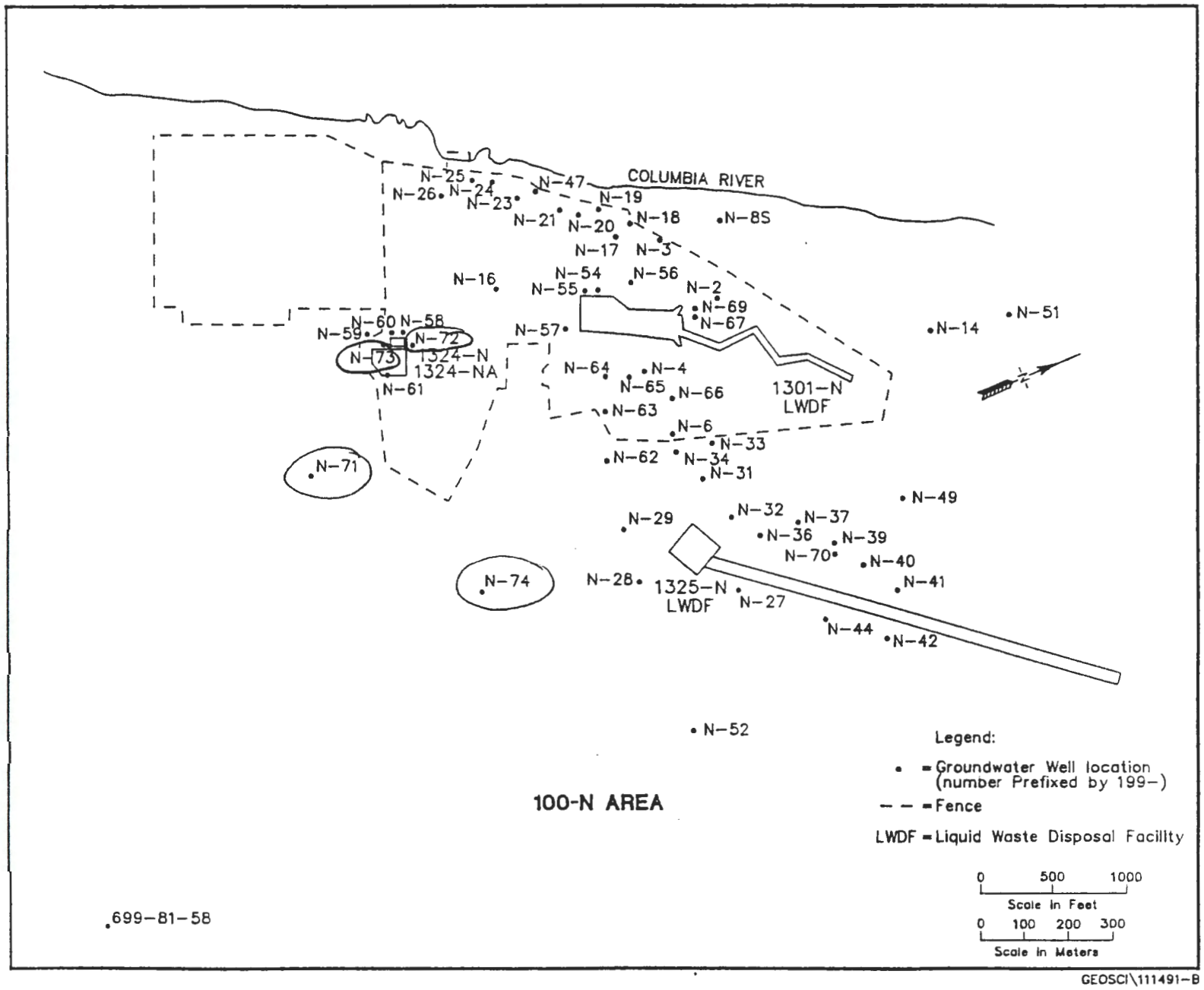

Figure 1. Location of Wells 199-N-71, 199-N-72, 199-N-73, and 199-N-74.

Table 1. Survey Data for Groundwater Monitoring Wells Installed in the 100-N Area in 1991.

Well	Datum or coordinate system[a]	Coordinates center of casing	Elevations (feet) Brass Marker in Concrete	Top Hydrostar* Plate North Side	Top Outer Casing North Side
N-71	100-N	5088.5 N 4643.8 W	459.49	462.52	462.50
	Hanford	83,696.76 N 59,945.50 W	N/A	N/A	N/A
	Lambert or NGVD'29	148,982.42 N 571,589.03 E	460.03	463.06	463.04
N-72	100-N	5,532.5 N 5,851.1 W	455.05	458.47	458.45
	Hanford	84,577.20 N 60,883.34 W	N/A	N/A	N/A
	Lambert or NGVD'29	149,249.91 N 571,302.37 E	455.59	459.00	458.99
N-73	100-N	5,275.7 N 5,779.1 W	459.45	462.75	462.74
	Hanford	84,312.68 N 60,917.40 W	N/A	N/A	N/A
	Lambert or NGVD'29	149,169.25 N 571,292.22 E	459.98	463.29	463.28
N-74	100-N	6,064.2 N 3,797.6 W	453.60	457.14	457.13
	Hanford	84,264.26 N 58,785.33 W	N/A	N/A	N/A
	Lambert or NGVD'29	149,156.41 N 571,942.09 E	454.14	457.68	457.66

[a]Lambert WCS83S coordinates in meters. 100-N coordinates in feet. Hanford coordinates (in feet) were converted from 100-N coordinates with the formulae: Hanford West = 57,659.1 + (100-N West)(cos 23°) - (100-N North)(sin 23°)
Hanford North = 77,198.3 + (100-N West)(sin 23°) + (100-N North)(cos 23°)

NGVD'29 elevations are feet above the National Geodetic Datum of 1929; 100-N elevations in feet above mean sea level.
N/A = not applicable.

Hanford coordinates and 100-N elevations are most comparable to survey data for other wells currently in the groundwater database.

*Hydrostar is a tradename of Instrumentation Northwest.

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2.0 WELL 199-N-71

2.1 DRILLING

Well N-71 was drilled with a cable tool rig. Drilling began on August 7, 1991, and was completed August 29, 1991, at a total depth of 87 ft below land surface (bls). Temporary, carbon steel casing was used during drilling: 12-in-diameter casing from surface to 12 ft bls; 10-in-diameter casing from surface to total depth. Approximately 285 gal of water were added during drilling. Drilling information is compiled in Appendix A.

Sediments were primarily sandy gravel to gravel (see borehole log in Appendix A). Some of the samples were crushed by hard tool drilling, when a drive barrel could not be used. Samples were collected approximately every 5 ft of depth for calcium carbonate analysis, radiological screening, and lithologic archiving. The contact between the Hanford and Ringold formations appears to be at approximately 55 ft bls. Moisture samples were collected above the water table where no water was added during drilling (four samples). A sample for grain size analysis was collected from the interval to be screened. Physical data for sediments are contained in Appendix B.

A gross gamma log was run on August 28, 1991, from 4 to 85.3 ft bls, through the temporary casing. Geophysical logs are in Appendix A.

The borehole and soils were monitored regularly for organic vapors and radioactive contaminants. There was no detectible contamination.

2.2 WELL COMPLETION

Permanent casing and screen were installed in well N-71 between 25 and October 28, 1991. Static water level at that time was 68.1 ft bls. A 20-slot, 4-in-diameter stainless steel screen was set from 84.5 to 63.8 ft bls. Permanent casing is 4-in-diameter stainless steel with centralizers, from 63.8-ft bls to above land surface. The sand pack is 10-20 mesh silica sand (85.8 to 59.7-ft bls). The annular seal comprises bentonite pellets (59.7 to 55.8 ft bls), bentonite crumbles (55.8 to 18.0 ft bls), and cement grout (18.0 to 3.0 ft bls). The remaining annulus was filled with concrete when a 4 ft by 4 ft by 6-in concrete pad was installed at the well head. A 6-in. protective casing with a locking cap was also installed at the well head. Four protective steel posts were set in concrete around the well. A brass marker stamped with the well number was set into the concrete. The center line of the well was surveyed to Lambert and 100-N coordinates. Elevation was surveyed to NGVD'29 and 100-N data. Elevations were established for the top of the Hydrostar plate, top of outer casing (north side), and the brass marker set in the concrete pad. Documentation of well completion is compiled in Appendix A.

When the 10-in. temporary casing was removed, it was discovered that a piece of the casing shoe had broken off. The site geologist also noted that some slag from cutting the temporary casing fell into the sand pack during completion. These irregularities were documented on a nonconformance report. A request for variance was submitted to the State of Washington Department of

Ecology (Ecology). A magnetic log was run to locate the depth of the casing shoe and slag. The log showed peaks at approximately 62 and 75 ft bls (see Appendix A). Since the shoe and slag are in the sand packed zone, they could cause increased metals concentrations in groundwater samples. Metals data from well N-71 will be flagged for at least the first year of monitoring.

The only additives during well drilling and completion were water and "well guard," a nonpetroleum-based lubricant used on casing threads and drilling tools.

2.3 WELL DEVELOPMENT AND PUMP INSTALLATION

Well N-71 was developed November 5, 1991. A submersible pump was used to remove 4,500 gal water from the well. Final turbidity was 6.5 nephelometric turbidity units. Drawdown and recovery data were measured with a transducer in the pumping well during development. A well development log is included in Appendix C. Water level data from development and recovery are included in Appendix D.

A dedicated Hydrostar sampling pump was installed in well N-71 on November 5, 1991. Its intake is at 82.4 ft below top of casing. A pump installation form is included in Appendix C.

2.4 AQUIFER TESTING

Water level data were collected during development, as described in Section 2.3. Transmissivity of the screened interval was estimated at 230 ft^2/d, based on discharge data, and 97 ft^2/d, based on recovery data. These values correspond to hydraulic conductivities of 14 and 5.8 ft/d, respectively. A slug injection and withdrawal test was also conducted in well N-71 on November 5, 1991, after development. Hydraulic conductivity of the screened interval was estimated at 23 ft/d. Aquifer test data and their interpretation are included in Appendix D.

3.0 WELL 199-N-72

3.1 DRILLING

Well N-72 was drilled with a cable tool rig. Drilling began on August 30, 1991, ard was completed September 16, 1991, at a total depth of 84.1 ft bls. Temporary, carbon steel casing was used during drilling: 12-in-diameter casing from surface to 10 ft bls; 10-in-diameter casing from surface to 85 ft bls. Approximately 73 gal of water were added during drilling. Drilling information is compiled in Appendix A.

Sediments were primarily sandy gravel and gravel (see borehole log in Appendix A). Some of the samples were crushed by hard tool drilling, when a drive barrel could not be used. Samples were collected approximately every

5 ft of depth for calcium carbonate analysis, radiological screening, and lithologic archiving. The contact between the Hanford and Ringold formations appears to be at approximately 65 ft bls. Moisture samples were collected above the water table where no water was added during drilling (three samples). Samples for chemical analysis were collected at 20, 30, 40, 50, and 60 ft bls. A sample for grain size analysis was collected from the interval to be screened. Physical sample data are contained in Appendix B. Chemical data are not yet available.

A gross gamma log was run September 16, 1991, through the temporary casing. A copy of the log is in Appendix A.

The borehole and soils were monitored regularly for organic vapors and radioactive contaminants. There was no detectible contamination.

3.2 WELL COMPLETION

Permanent materials were installed in well N-72 between October 25 and 30, 1991. Static water level at that time was 65.1 ft bls. A 20-slot, 4-in-diameter stainless steel screen was set from 82.3 to 61.2 ft bls. Permanent casing is 4-in-diameter stainless steel with centralizers, from 61.2 ft bls to above land surface. The sand pack is 10-20 mesh silica sand (83.0 to 59.3 ft bls). The annular seal comprises bentonite pellets (59.3 to 55.5 ft bls), bentonite crumbles (55.5 to 20.5 ft bls), and cement (20.5 to 1.6 ft bls). The remaining annulus was filled with concrete when a 4 ft by 4 ft by 6-in. concrete pad was installed at the well head. A 6-in. protective casing with a locking cap was also installed at the well head. Four protective steel posts were set in concrete around the well. A brass marker stamped with the well number was set into the concrete. The center line of the well was surveyed to Lambert and 100-N coordinates. Elevation was surveyed to NGVD'29 and 100-N data. Elevations were established for the top of the Hydrostar plate, top of outer casing (north side), and the brass marker set in the concrete pad. Documentation of well completion is compiled in Appendix A.

The only additives during well drilling and completion were water and "well guard," a nonpetroleum-based lubricant used on casing threads and drilling tools.

3.3 WELL DEVELOPMENT AND PUMP INSTALLATION

Well N-72 was developed November 7, 1991. A temporary submersible pump was used to remove 6,325 gal of water from the well, until the turbidity was 5 nephelometric turbidity units. Drawdown and recovery data were measured with a transducer in the pumping well during development. A well development log is included in Appendix C. Water level data from development and recovery are included in Appendix D.

A Hydrostar sampling pump was installed in well N-72 on November 8, 1991. The pump's intake is at 82.5 ft below top of casing. A pump installation form is included in Appendix C.

3.4 AQUIFER TESTING

Water level data were collected during development, as described in Section 3.3, but the data could not be analyzed to estimate aquifer properties. A slug injection and withdrawal test was conducted in well N-72 on November 8, 1991, after development. The hydraulic conductivity of the screened interval was estimated at 21 ft/d. Aquifer test data and their interpretations are included in Appendix D.

4.0 WELL 199-N-73

4.1 DRILLING

Well N-73 was drilled with a cable tool rig. Drilling began on August 26, 1991, and was completed September 16, 1991, at a total depth of 89.1 ft bls. Temporary, carbon steel casing was used during drilling: 12-in-diameter casing from surface to 20 ft bls; 10-in-diameter casing from surface to 87 ft bls. Approximately 335 gal of water were added during drilling. Drilling information is compiled in Appendix A.

Sediments were primarily gravel to sandy gravel (see borehole log in Appendix A). Hard tool drilling was used throughout the hole. Samples were collected approximately every 5 ft of depth for calcium carbonate analysis, radiological screening, and lithologic archiving. The contact of the Hanford and Ringold formations appears to be between 60 and 70 ft bls. No moisture samples were collected in well N-73. A sample for grain size analysis was collected from the interval to be screened. Physical data for sediments are contained in Appendix B.

A gross gamma log was run September 16, 1991, through the temporary casing. Geophysical logs are in Appendix A.

The borehole and soils were monitored regularly for organic vapors and radioactive contaminants. There was no detectible contamination.

4.2 WELL COMPLETION

Permanent materials were installed in well N-73 on October 30 and 31, 1991. Static water level at this time was 69.3 ft bls. A 20-slot, 4-in-diameter stainless steel screen was set from 86.1 to 65.4 ft bls. Permanent casing is 4-in-diameter stainless steel with centralizers, from 65.4 ft bls to above land surface. The sand pack is 10-20 mesh silica sand (87.4 to 60.5 ft bls). The annular seal comprises bentonite pellets (60.5 to 55.5 ft bls), bentonite crumbles (55.5 to 19.7 ft bls), and cement grout (19.7 to 2.0 ft bls). The remaining annulus was filled with concrete when a 4 ft by 4 ft by 6-in. concrete pad was installed at the well head. A 6-in. protective casing with a locking cap was also installed at the well head. Four protective steel posts were set in concrete around the well. A brass marker stamped with the well number was set into the concrete. The center line of the well was surveyed to Lambert and 100-N coordinates. Elevation was

surveyed to NGVD'29 and 100-N data. Elevations were established for the top of the Hydrostar plate, top of outer casing (north side), and the brass marker set in the concrete pad. Well completion documents are compiled in Appendix A.

The only additives during well drilling and completion were water and "well guard," a nonpetroleum-based lubricant used on casing threads and drilling tools.

4.3 WELL DEVELOPMENT AND PUMP INSTALLATION

Well N-73 was developed November 6, 1991. A temporary submersible pump was used to remove 3,282 gal of water from the well, until the turbidity was 5.6 nephelometric turbidity units. Drawdown and recovery data were measured with a transducer in the pumping well during development. A well development log is included in Appendix C. Water level data from development and recovery are included in Appendix D.

A Hydrostar sampling pump was installed in well N-73 on November 6, 1991. Its intake is at 87.3 ft below top of casing. A pump installation form is included in Appendix C.

4.4 AQUIFER TESTING

Water level data were collected during development, as described in Section 4.3, but it was not possible to estimate aquifer properties from the data. A slug injection and withdrawal test was conducted in well N-73 on November 6, 1991, after development. Hydraulic conductivity was estimated at 9.5 ft/d. Aquifer test data and interpretation are compiled in Appendix D.

5.0 WELL 199-N-74

5.1 DRILLING

Well N-74 was drilled with a cable tool rig. Drilling began on August 7, 1991, and was completed August 29, 1991, at a total depth of 84.0 ft bls. Temporary, carbon steel casing was used during drilling: 12-in-diameter casing from surface to 10 ft bls; 10-in-diameter casing from surface to 84 ft bls. Approximately 410 gal of water were added during drilling. Drilling information is compiled in Appendix A.

Sediments were primarily gravel to sandy gravel (see borehole log in Appendix A). Hard tool drilling was used through most of the hole. Samples were collected approximately every 5 ft of depth for calcium carbonate analysis, radiological screening, and lithologic archiving. The contact of the Hanford and Ringold formations appears to be approximately 77 to 80 ft bls. Two moisture samples were collected in well N-74. A sample for grain size analysis was collected from the interval to be screened. Physical data for sediments are contained in Appendix B.

A gross gamma log was run August 29, 1991, through the temporary casing. A copy of the log in included in Appendix A.

The borehole and soils were monitored regularly for organic vapors and radioactive contaminants. There was no detectible contamination.

5.2 WELL COMPLETION

Permanent materials were installed in well N-74 between October 22 and 29, 1991. Static water level at that time was 62.3 ft bls. A 10-slot, 4-in-diameter stainless steel screen was set from 79.7 to 59 ft bls. Permanent casing is 4-in-diameter stainless steel with centralizers, from 59 ft bls to above land surface. The sand pack is 20-40 mesh silica sand (84.2 to 55.8 ft bls). The annular seal comprises bentonite pellets (55.8 to 52.7 ft bls), bentonite crumbles (52.7 to 20.2 ft bls), and cement grout (20.2 to 3.5 ft bls). The remaining annulus was filled with concrete when a 4 ft by 4 ft by 6-in. concrete pad was installed at the well head. A 6-in. protective casing with a locking cap was also installed at the well head. Four protective steel posts were set in concrete around the well. A brass marker stamped with the well number was set into the concrete. The center line of the well was surveyed to Lambert and 100-N coordinates. Elevation was surveyed to NGVD'29 and 100-N data. Elevations were established for the top of the Hydrostar plate, top of outer casing (north side), and the brass marker set in the concrete pad. Well completion documents are compiled in Appendix A.

The only additives during well drilling and completion were water and "well guard," a nonpetroleum-based lubricant used on casing threads and drilling tools.

5.3 WELL DEVELOPMENT AND PUMP INSTALLATION

Well N-74 was developed November 4, 1991. A temporary submersible pump was used to remove 310 gal of water from the well, until the turbidity was 3.2 nephelometric turbidity units. Drawdown and recovery data were measured with a transducer in the pumping well during development. A well development log is included in Appendix C. Water level data from development and recovery are included in Appendix D.

A Hydrostar sampling pump was installed in well N-74 on 4 November 1991. Its intake is at 77.1 ft below top of casing. A pump installation form is included in Appendix C.

5.4 AQUIFER TESTING

Water levels were measured during development, as described in Section 5.3, but it was not possible to estimate aquifer properties from the data. A slug injection and withdrawal test was conducted in well N-74 on November 4, 1991, after development. Hydraulic conductivity of the screened interval was estimated at 96 ft/d. Aquifer test data and their interpretation are included in Appendix D.

6.0 REFERENCES

Hartman, M. J., 1991, *Groundwater Monitoring Plan for the 1301-N, 1324-N/NA, and 1325-N Facilities*, WHC-SD-EN-AP-038, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Generic Specifications-Groundwater Monitoring Wells*, WHC-S-014, Rev. 5, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

DRILLING AND CONSTRUCTION DATA

This appendix includes the following records for each well:

1) Well summary sheet
2) Well construction report
3) Borehole log
4) Well construction schedule.

Geophysical logs are provided at the end of the appendix.

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WELL 199-N-71

9413224.0018

~~3 of 4~~

WELL SUMMARY SHEET

Boring or Well No. 199 - N - 71

Sheet 1 of 1

Location 100 N AREA

Elevation 460.03 Brass Cap

Driller JOE OCKERT

Prepared By [illegible] (Sign/Print Name) Date 08/29/91

Project RCRA WQ17/100-N 1724 N/NA FACILITY AND 1325 N FACILITY

Drilling Contractor KEH

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22 W

Reviewed By EDWARD C. KOPPE (Sign/Print Name) Date 2/12/92

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
12" SURFACE CASING SET @ 12.61' BLS		5.0		SLIGHTLY GRAVELLY SILT
NO SHOE USED ON SURFACE CASING		10.0		SILTY SANDY GRAVEL
		15.0		GRAVELLY SANDY SILT
3.0-18.0' CEMENT GROUT		20.0		GRAVELLY SANDY SILT
		25.0		GRAVEL
		30.0		GRAVEL
		35.0		GRAVEL
18.0' - 55.8' Crumbles		40.0		GRAVEL
		45.0		SANDY GRAVEL
		50.0		SANDY GRAVEL
ESTIMATED DEPTH of PELLETS BROKEN OFF SHOE 62.5'		55.0		SANDY GRAVEL
55.8' - 59.7' - Pellets		60.0		SANDY GRAVEL
2 boulders 1/4" 1 boulder 3/8"		65.0		SANDY GRAVEL
STATIC WATER LEVEL ~68.1' bls 10-25-91		70.0		SANDY GRAVEL
59.7' - 84.8' (25.1 LOW) 10-20 SAND		75.0		SANDY GRAVEL
T-304/4"/20 SLOT SCREEN 63.8'-84.5'		80.0		SANDY GRAVEL
10" CASING SET AT 86.32' BLS		85.0		85.0-86.1 GRAVELLY SAND, 86.1-87.0 SANDY GRAVEL
SHOE USED T.D. Drilled 87.05'		90.0		DRILLED DEPTH OF HOLE = 87.05' BLS
4" T-304 STAINLESS PERMANNET CASING.				
bottom of well set @ 84.8' bls				

A-2

A-6000-384 (04/90)

WHC-SD-EN-DP-040, Rev. 0

WELL CONSTRUCTION REPORT

VALIDATED KDR 2/19/92 SIGNATURE/DATE

Specification No. WHC-S-014 Rev No. 5 (See Comments)

ECNs 144240, 144241, 127437 See Comments

Project 100-N, 1324-N/NA FACILITY AND 1325-N FACILITY

Location 100-N AREA

Drilling Company KEH

Driller JOE OCKERT

Other (Companies) WHC, EBASCO, SALEM, HART CROWSER

Geologist(s) WILLIAM C. BRENNAN - EBASCO
Dennis J. ANDERSON - Salem
Chris Wright - Hart Crowser KD Reynolds (WHC)
Ken Lane - Hart Crowser, J. A Coates

Well No. 199-N-71 Temp. Well No.

Coordinates N: 148,982.42 E 571,589.03

Casing Elev. 463.04' Ground Elev. 460.03 Brass Cap

Drilling Method

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 5.2, 5.3, 7.5; EEF 6.7 SEC 6.2

			Initials	Date
Rotary	Air N/A	Mud N/A	WCB	082991
Cable Tool	D 57.0'-65.0'	H ~~D 65'-87.0'~~ 6.23'-57.0'	WCB	080791
Drilling Fluid	RAW H_2O	285 GAL.	WCB	08 08 91
Other	BACKHOE	0'-6.23' BGS	WCB	080791

Geophysical Logging

Sondes	Interval	Date
GROSS GAMMA	85.3'-4.0	082991
MAGNETIC LOG	83.0'-0.0'	10/25/91
	-	
	-	
	-	

Completion Data

Drilled Depth 87.05' (BGS) BELOW LAND SURFACE

Completed Depth 84.8' BOTTOM OF WELL

Date Started 08 07 91

Date Completed 10/28/91

Static Water Level/Date 68.02 BGS - 082991
10-25-91 68.1' BGS K.L.

Aquifer Testing

Type INSTANTANEOUS SLUG TEST

Flow Meter I.D. No. -NA-

Cal. Due Date -NA-

Length of Test 1 HR

Volume Pumped -NA-

Drawdown -NA-

Date of Test 11/5/91

Completion Results

Cleaning

Verification Method VISUAL INSP. & DIRECT OBS. OF DOC.

Criteria WHC-S-014 4.2.2, 7.6, 7.7; WHC-C/M 7.7 SEC 5.4

	Initials	Date
Drilling Tools/Rig	WCB	08 07 91
Temporary Materials	WCB	080791
Permanent Materials	K.L. GREEN TAGS	10-25-91

Screen

Type	Length	Slot Size
T-304 4"	21.10' SECTIONS 20.76' W/O END CAP 21.04 W/ END CAP	20 SLOT

Depth(s) 63.8' - 84.5'

Verification Method STEEL TAPE MEASUREMENT

Criteria WHC-S-014 4.2.3, 4.2.5, 12.2.1, 4.2.1

Initials K.L. Date 10-25-91

Material Storage/Packing

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 4.2.3, 7.3

	Initials	Date
Mtl. Handling/Storage	KDR	11/10/91
Material Packing	K.L.	10-25-91

Lubricants/Additives

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 7.2

	Identify	Initials	Date
Additives	RAW H_2O	WCB	080891
Lubricants	WELL GUARD	WCB	080891

Straightness Test

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 8.2

Initials WCB ETC Date 082991

A-6000-436 (09/90)

WELL CONSTRUCTION REPORT
(continuation sheet)

well # 199-N-71

Casing (permanent)

Type	Size	Placement
T-304 4" 20 SLOT	4"	63.8 - 84.8'
T-304 schedule 5 blank	4"	-6.6' AGL - 63.8' bls
		-
		-

Verification Method MEASURING USING STEEL TAPE

Criteria WHC-S-014 4.2.1, 4.2.4, 4.2.5, 12.2-1

Initials K.L. Date 10-25-91

Well Protection

Verification Method VISUAL INSPECTION w/ TAPE

Criteria WHC-S-014 4.2.10

	Initials	Date
Protective Posts	E.C.D	1/24/92
Protective Casing	E.C.D	1/24/92
Site Restored	E.C.D	1/24/92
Cap, Hasp and Lock	E.C.D	1/24/92
Surface Pad	E.C.D	1/24/92

Annular Seal/Filter Pack

Verification Method MEASURING USING STEEL TAPE Criteria WHC-S-014 4.2.6, 4.2.7, 4.2.8, 4.2.9, 5.3.1

Type	Interval	Volume	Initials	Date
SAND 10-20	85.8' - 59.7'	1500 lb 15 bags	K.L.	10-25-91
BENTONITE PELLETS	59.7' - 55.8'	150 lb 3 buckets	K.L.	10-25-91
BENTONITE CRUMBLES	55.8' - 18.0'	1700 lb 34 bags	K.L.	10-25-91
CEMENT GROUT	18.0' - ~3.0'	2256 lb 24 bags	K.L.	10-25-91

Well Survey/Labeling

Verification Method REVIEW OF SURVEY REPORT

Criteria WHC-S-014 3.4

	Initials	Date
Measurement Point/Surveyed	E.C.D	1/24/92
Protective Casing/Brass Cap Surveyed	E.C.D	1/24/92
Well Number Stenciled	E.C.D	1/24/92
Brass Cap Labeled	E.C.D	1/24/92

Pump Installation

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 4.2.11, 4.2.2

	Initials	Date
Pump Decon/Prep	J.A.C	11/5/91
Installed	JAC	11/5/91
Pump Tested	JAC	11/5/91

Other (initial if performed)

NA Well Abandonment NH Downhole TV Inspection (Rw) Complete As-Built Diagram, Driller's/Geologist's Logs

JAC 11/5/91 Well Development

Comments/Remarks WATER ADDED AS FOLLOWS: 20 GAL 080391, 30 GAL 080491, 40 GAL 081291, 40 GAL 081391, 39 GAL 081491, 30.0 GAL 081591, 25.0 GAL 081691, 33.0 GAL 081991, 5.0 GAL 082091, 17.5 GAL 082691, 5.0 GAL 082791

DECON OF DRILL RIG/TOOLS: 072991, 080691, 082491 (Replacement Rig)

DECON OF TEMP. MATERIALS: 072991, 080991, 082191, 082791

MAGNETIC LOG RUN 10/28/91 TO LOCATE BROKEN PIECE OF 10" SHOE ESTIMATED @ ~62.5' bls

NOTE: All work done after 10/2/91 was to WHC-S-014 Rev6, with GEN'S 150132, 164223, 127439

WELL GROUND USED: 080491, 080991, 081391, 082891

Reviewed By (Sign/Print Name) [illegible] Date 2/3/92

A-6000-436 (09/90)

BOREHOLE LOG

VALIDATED KDR 2/19/92 SIGNATURE/DATE

Boring or Well No. 199-N-71

Sheet 1 of 5

Location 100-N AREA

Project RCRA W017 / 100 N 1324-N/NA FACILITY AND 1325-N FACILITY

Elevation 460.03 BRASS CAP

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By WILLIAM C. BRENNAN (Sign/Print Name) Date 081391

Reviewed By R. D. Miller (Sign/Print Name) Date 8/14/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
0.0'	1 RAD 1 MOIST 2 LITH	BACKHOE		0-3.5' SLIGHTLY GRAVELLY SILT (5% GRAVEL, 95% SILT) 35% MP, 35% FP, 30% VFP - 95% SILT, 5% CLAY. 10YR 3/2 - VERY DARK GRAYISH BROWN (WET), 10YR 5/4 YELLOWISH BROWN (DRY). SAMPLE IS DRY, WELL SORTED, GRAVEL CONSTITUENT IS ROUNDED TO WELL ROUNDED, SPHERICAL TO SUBDISCOIDAL. MINEROLOGY OF GRAVEL: 50% BASALT, 50% FELSIC. NO RXN TO 10% HCL, NON PLASTIC.	COLLECT SURFACE SAMPLE ON 080791 @ 1415
3.5'					
5.0'	1 RAD 1 MOIST 2 LITH	BACKHOE		3.5'-5.0' SILTY SANDY GRAVEL (60% GRAVEL, 30% SAND, 10% SILT) 30% LC, 30% SC, 15% VCP, 10% CP, 5% MP, 5% FP, 5% VFP - 5% VCS, 5% CS, 5% MS, 40% FS, 45% VFS - 95% SILT, 5% CLAY. 10YR 3/4 DARK YELLOWISH BROWN (WET), 10YR 6/4 LIGHT YELLOWISH BROWN (DRY). SAND IS DRY. MODERATELY SORTED, SUBROUNDED TO WELL ROUNDED, SPHERICAL TO SUBDISCOIDAL. COBBLES HAVE A $CaCO_3$ COATING THAT HAS A STRONG REACTION TO 10% HCL. MINEROLOGY: 90% MAFIC (BASALT), 5% FELSIC, 5% QTZ	COLLECT 5' SAMPLE ON 080791 @ 1415 20 GAL RAW H_2O ON 080891 30 GAL RAW H_2O ON 080991 40 GAL RAW H_2O ON 081291
10.0	1 RAD 1 ABSIF 2 LITH	HACOTOOL		10.0 GRAVELLY SANDY SILT (30% GRAVEL, 30% SAND, 40% SILT) 30% MP, 35% FP, 35% VFP - 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS - 100% SILT. 5Y 3/1 VERY DARK GRAY (WET), 5Y 4/1 GRAY (DRY), WET. WELL SORTED, SUBANGULAR TO ANGULAR, SUBPRISMOIDAL TO DISCOIDAL. 90% MAFIC (BASALT), 5% FELSIC, 5% QTZITE. NO RXN TO 10% HCL.	COLLECT 10' SAMPLE 081291 @ 1430 NOTE: ESTIMATES BASED ON VISUAL APPEARANCE OF SAMPLE. THE HT DRILLING PROCESS MOST LIKELY SIGNIFICANTLY ALTERED ALL SIZE DISTRIBUTIONS, ANGULARITY AND SHAPE. IN SITU MATERIAL IS PROBABLY PRIMARILY GRAVEL SIMILAR TO 5.0' DESCRIPTION
15.0	1 RAD 1 $CaCO_3$ 2 LITH	HACOTOOL		15.0 SAME AS ABOVE - IN-SITU MATERIAL PROBABLY GRAVEL TO SILTY SANDY GRAVEL	SAMPLE COLLECTED ON 081391 @ 1345 40 GAL RAW H_2O ON 081391

A-6000-382 (04/90)

9413224.0022

BOREHOLE LOG

Boring or Well No. 199-N-71

Sheet 2 of 5

Location 100-N-AREA

Project RCRA W017/100N 1324-N/NA FACILITY AND 1325-N FACILITY

Elevation 460.03 Brass Cap

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By [signature] WILLIAM C. BRENNAN (Sign/Print Name) Date 081491

Reviewed By [signature] (Sign/Print Name) Date 8/31/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
20.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		20.0 GRAVEL ?? (85% - 95% GRAVEL, 5% - 15% SAND) ?? ?? 50-75% LC, 15-25% SC, 2-5% VCP, 2-5% CP, 2-5% MP, 2-5% FP, 2-5% VFP - 30-40% VCS, 25-30% CS, 10-20% MS, 10-15% FS, 10% VFS.?? 5Y3/1 VERY DARK GRAY (WET), 5Y6/1 GRAY (DRY). SAMPLE IS WET ?? POORLY SORTED ?? UNBROKEN PARTICLES ARE SUBROUNDED TO ROUNDED, SPHERICAL TO SUBDISCOIDAL. 90% BASALT, 10% QUITE, GRANITIC MATERIAL. NO RXN TO 10% HCL	SAMPLE COLLECTED 081491 @ 1315 NOTE: DESCRIPTION IS BEST ESTIMATE OF IN-SITU MATERIAL. LARGEST MATERIAL SIZE IN THE HARDTOOL SAMPLE IS MPEBBLE 39.0 GAL RAW H_2O ON 081491
25.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		25.0 SAMPLE SAME DESCRIPTION AS ABOVE.	SAMPLE COLLECTED 081591 @ 0845
30.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		30.0 GRAVEL - PARTICLE SIZE DIST, COLOR, MOISTURE, SORTING, ANGULARITY - SAME AS 20' SAMPLE. MINERALOGY: 80% BASALT, 10% GRANITE, 5% QTZ, 5% QTZE NO RXN TO 10% HCL	SAMPLE COLLECTED 081591 @ 1315 30.0 GAL RAW H_2O ON 081591
35.'					
36.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		36.0 GRAVEL - PARTICLE SIZE DIST, COLOR, MOIST, SORTING, ANGULARITY - SAME AS 20' SAMPLE. MINERALOGY: 90% BASALT, 5% QTZ/QTZITE, ? CHERT, 5% GRANITE	SAMPLE COLLECTED 081691 @ 0750
40.'					

A-6000-382 (04/90)

BOREHOLE LOG

Boring or Well No. 199-N-71

Sheet 3 of 5

Location 100-N AREA

Project RCRA WQ17/100-N 1324 N/NA FACILITY AND 1325-N FACILITY

Elevation 460.03' Brass Cap

Drilling Contractor KEH

Driller JOE ECKERT

Drilling Method and Equipment CABLETOOL BUCYRUS ERIE 22-W

Prepared By William C. Bergman (Sign/Print Name) Date 081691

Reviewed By R.D. Miller (Sign/Print Name) Date 8/31/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
40.0	1 RAD 1 CaCO3 2 LITH	HARDTOOL		40.0 GRAVEL (?? 85-95% GRAVEL, 5-15% SAND ??) ?? 50-75% LC, 15-25% SC, 2-5% VCP, 2-5% CP, 2-5% MP, 2-5% FP, 2-5% VFP - POSSIBLY BOULDER SIZE MATERIAL IN IN-SITU MATERIAL - 30-40% VCS, 25-30% CS, 10-20% MS, 10-15% FS, 10% VFS ?? 5Y 3/1 VERY DARK GRAY (WET), 5Y 6/1 GRAY (DRY). SAMPLE IS WET. ?? POORLY SORTED ?? ANGULAR TO ROUNDED. 90% BASALT, 5% GRANITIC MATERIAL, 5% QTZ/QTZITE. NO RXN TO 10% HCL	SAMPLE COLLECTED 081691 @ 1630 NOTE: DESCRIPTION IS BEST ESTIMATE OF INSITU MATERIAL. LARGEST PARTICLE SIZE IN HARDTOOL SAMPLE IS MP NOTE: INSITU MATERIAL PROBABLY SUBROUNDED TO ROUNDED
45.0	1 RAD 1 CaCO3 2 LITH	HARDTOOL		45.0 ~~SAME AS ABOVE~~ SANDY GRAVEL (10% SAND 90% GRAVEL) ?? 10% VCS, 15% CS, 45% MS, 15% FS, 15% VFS - 50% SC, 10% VCP, 10% CP, 10% MP, 10% FP, 10% VFP ?? 10YR 5/1 GRAY (DRY), 10YR 3/1 VERY DARK GRAY (WET). SAMPLE WET. ?? POORLY SORTED ?? SUBANGULAR TO SUBROUNDED, SPHERICAL TO SUBDISCOIDAL, 85% BASALT, 5% QTZ/QTZITE, 5% GRAN, 5% PORPH. SOME MAG MINERALS. NO RXN TO 10% HCL	SAMPLE COLLECTED 081991 @ 0915 NOTE: DESCRIPTION IS BEST EST. OF INSITU MATERIAL. LARGEST PARTICLE SIZE IN HARDTOOL SAMPLE IS MP 33.0 GAL RAW HLD ON 081991
50.0	1 RAD 1 CaCO3 2 LITH	HARDTOOL		50.0 DESCRIPTION SAME AS 45.0' SAMPLE SANDY GRAVEL	SAMPLE COLLECTED 082091 @ 0745
55.0	1 RAD 1 CaCO3 2 LITH	HARDTOOL DRIVE BARREL		55.0 SANDY GRAVEL (60% SAND, 40% GRAVEL) 5% VCS, 5% CS, 30% MS, 30% FS, 30% VFS - 60% SC, 15% VCP, 10% CP, 5% MP, 5% FP, 5% VFP. 2.5YR 7/4 PALE YELLOW (DRY), 2.5Y 5/3 LGT OLIVE BROWN (WET) FOR 57' SAMPLE. 10YR 5/1 (DRY), 10YR 3/1 (WET) FOR 55' SAMPLE. 55' SAMPLE WET, 57' SAMPLE MOIST. MODERATELY SORTED, SUBROUNDED, SPHERICAL TO SUBDISCOIDAL. 25% BASALT, 35% PORPH, 10% GRAN, 10% RHYOLITE, 20% QTZ/QTZITE. SOME MAG MINERALS, NEAR TO STRONG RXN TO 10% HCL IN 57' SAMPLE A-7	SAMPLE COLLECTED 082091 @ 0940 DESCRIPTION BASED ON 55' HT SAMPLE AND 57' DB SAMPLE. DB SAMPLE IS PROBABLY ~~AND~~ SIGNIFICANTLY MORE REPRESENTATIVE OF INSITU MATERIAL THAN HT SAMPLE

9413224.0024

BOREHOLE LOG

Boring or Well No. 199-N-71

Sheet 4 of 5

Location 100-N AREA

Project KCRA W017/100-N 1324 N/NA FACILITY AND 1325-N FACILITY

Elevation 460.03 BRASS CAP

Drilling Contractor KEH

Driller JOE COLLETT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By (Sign/Print Name) WILLIAM C. BRENNAN Date 082091

Reviewed By (Sign/Print Name) R.D. Miller Date 8/31/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
60.0	1 RAD 1 $CaCO_3$ MINST 2 LITH	DRIVE BARREL		60.0 SANDY GRAVEL (35% SAND, 65% GRAVEL) (TRACE SILT) 5% VCS, 5% CS, 20% MS, 35% FS, 35% VFS - 50% SC, 15% VCP, 15% CP, 10% MP, 5% VFP, 5% FP. 2.5 Y 6/2 LIGHT BROWNISH GRAY (DRY), 2.5 Y 5/3 LIGHT OLIVE BROWN (WET). SAMPLE DRY, MODERATELY SORTED, SUBANGULAR TO ROUNDED. 35% BASALT, 25% PORPH, 15% GRAN, 25% QTZ/QTZE/CHERT. SOME MAG MINERALS. WEAK TO STRONG RXN TO 10% HCL	SAMPLE COLLECTED 082091 @ 1500 5.0 GAL RAW H_2O ON 082091
65.0	1 RAD 1 $CaCO_3$ MINST 2 LITH	DRIVE BARREL		65.0' SANDY GRAVEL SAME DESCRIPTION AS ABOVE, BUT SAMPLE MOIST. WEAK RXN TO 10% HCL	SAMPLE COLLECTED 082191 @ 0940
70.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		70.0' SANDY GRAVEL (55% SAND, 45% GRAVEL TO SILT) 5% VCS, 15% CS, 30% MS, 25% FS, 25% VFS - ?? 10% SC, 10% VCP, 10% CP, 25% MP, 30% FP, 15% VFP ??. 5Y 7/2 LIGHT GRAY (DRY), 5Y 4/2 OLIVE GRAY (WET). SAMPLE WET. ?? POORLY SORTED ?? SUBROUNDED TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 45% BASALT, 25% GRANITIC FELSIC MATERIAL, 30% QTZ/QTZE/CHERT. SOME MAG MINERALS. WEAK TO STRONG RXN TO 10% HCL	SAMPLE COLLECTED 082691 @ 1055 NOTE: DESCRIPTION IS BEST ESTIMATE OF IN SITU MATERIAL. LARGEST PARTICLE SIZE IN HARDTOOL SAMPLE IS MP. ACTUAL SAMPLE IS MODERATELY SORTED 17.5 GAL RAW H_2O ON 082691
75.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		75.0 SANDY GRAVEL (60% SAND, 40% GRAVEL, TO SILT) 10% VCS, 10% CS, 20% MS, 30% FS, 30% VFS - 25% MP, 50% FP, 25% VFP. 5Y 4/2 OLIVE GRAY (WET), 5Y 5/3 OLIVE (DRY). SAMPLE WET. MODERATELY SORTED, SUBANGULAR TO SUBROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 35% BASALT, 30% GRANITIC FELSIC MATERIALS, 35% QTZ/QTZE/CHERT. SOME MAG MINERALS. WEAK TO NONE RXN TO 10% HCL	SAMPLE COLLECTED 082691 @ 1400 SAMPLE MATERIAL IS PROBABLY GOOD REPRESENTATION OF IN SITU MATERIAL - AS PER DRILLER. IS NOT SIGNIFICANTLY ALTERED BY DRILLING PROCESS
80.'					

9413224.0025

BOREHOLE LOG

Boring or Well No. 199-N-71

Sheet 5 of 5

Location 100-N AREA

Project RCRA K/017/100-N 1324-N/NA FACILITY & 1325-N GROUNDWATER

Elevation 460.03 BLMS CWP

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL WALKER NEER W3-31

Prepared By William C. Brennan (Sign/Print Name) Date 082791

Reviewed By R.D. Miller (Sign/Print Name) Date 8/31/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
80.0	1 RAD 1 $CaCO_3$ 2 LITH	HARDTOOL		80.0 SANDY GRAVEL (45% SAND, 50% GRAVEL 5% SILT) 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS - 15% CP, 45% MP, 20% FP, 20% VFP - 100% SILT - NO CLAY. 5Y 4/1 DARK GRAY (WET) 5Y 7-8/2 WHITE TO LIGHT GRAY (DRY). SAMPLE WET. POORLY SORTED - SUBROUNDED TO WELL ROUNDED. SUBDISCOIDAL TO SUBPRISMOIDAL. 50% BASALT, 20% GRANITIC / FELSIC PORPHYRY MATERIALS, 25% QTZ/QTZE/CHERT, 5% EPIDOTE/OLIVINE? SOME MAG MINERALS. STRONG RXN TO 10% HCL.	SAMPLE COLLECTED 082791 @ 1105 SAMPLE LOGGED AS ACTUAL SIZE DISTRIBUTION IN SAMPLE 5.0 GAL RAW H_2O ADDED 082791
85.0	1 RAD 1 $CaCO_3$ 2 LITH	ST 85.0- 87.0'		85.0 - 86.1 GRAVELLY SAND (30% GRAVEL, 70% SAND, TR SILT) 25% MP, 40% FP, 25% VFP 15% VCS, 15% CS, 25% MS, 25% FS, 20% VFS. 5Y 7/3 PALE YELLOW (DRY), 5Y 4/2 OLIVE GRAY (WET). SAMPLE WET. MODERATELY TO WELL SORTED, SUBROUNDED TO SUBANGULAR, SUBDISCOIDAL TO SUBPRISMOIDAL. 40% BASALT, 35% QTZ/QTZE/CHERT, 25% GRANITIC/FELSIC/PORPHYRY MATERIALS. SOME MAG MINERALS. WEAK RXN TO 10% HCL	SAMPLE COLLECTED 082891 @ 1020
86.0					
87.0				86.1 - 87.0 SANDY GRAVEL (35% SAND, 65% GRAVEL) 10% VCS, 15% CS, 40% MS, 20% FS, 15% VFS - 50% SC, 20% VCP, 10% CP, 10% MP, 10% FP, 10% VFP 5Y 6/2 LIGHT OLIVE GRAY (DRY), 5Y 4/2 OLIVE GRAY (WET), SAMPLE WET. POORLY SORTED, SUBANGULAR TO WELL ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 50% BASALT, 25% GRANITIC/FELSIC MATERIAL, 25% QTZ/QTZE/CHERT. SOME MAG MINERALS. WEAK RXN TO 10% HCL	TOTAL DEPTH = 87.05' BLS

9113224.0026

100-N FACILITY

WELL 199-N-71

DRILLING

START DATE	FINISH DATE	TOTAL DAYS	CURRENT DEPTH	FINAL DEPTH	DEPTH TO WATER	WATER ADDED(GAL)
080791	082991	17	N/A	87.0'	082691 68.1' 082791 68.6' 082891 68.1' 082991 68.0'	285

DOWN HOLE COMPLETION

START DATE	FINISH DATE	TOTAL DAYS	DEPTH TO WATER	DEPTH TO BOTTOM	DEPTH OF SCREEN	WATER ADDED/ REMOVED (GAL)
102591	102891	2	102591 68.1'	85.8'	63.8'-84.5'*	35 GALLONS REMOVED TO DEVELOP FILTER PACK.

*84.8 w/END CAP

DEVELOPMENT AND ASSOCIATED ACTIVITIES

TV CAMERA DATE	AQUIFER TEST DATE	DEVELOPMENT DATE	HYDROSTAR PLACEMENT DATE	WATER REMOVED(GAL)
N/A	110591	110591	110591	4500 GALLONS

COMMENTS:

VALIDATED
KDR 2/19/92
SIGNATURE/DATE

WELL CHECK LIST

Well Number: 199-N-71 Location: 100N (9)

Date: 1/24/92

	Yes	No
Hasp on protective casing	✓	
Lock	✓	
Proper cap fit	✓	
Well ID number on brass cap	✓	
Protective post painted	✓	
Well ID number stenciled on post	✓	
Well ID number stenciled on protective casing	✓	
Survey mark on casing	✓	
Stock tank		✓
Site neat	✓	

Comments:

Signature: Edward C. Rafuse Date: 1/24/92

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WELL 199-N-72

9413224.0030

WELL SUMMARY SHEET

Boring or Well No. 199-N-72

Sheet 1 of 1

Location 100-N AREA

Project 100-N, 1324 N/NA FACILITY AND 1325-N FACILITY

Elevation 455.59' Brass Cap

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By WILLIAM C. [illegible] (Sign/Print Name) Date 090491

Reviewed By EDWARD C. RUFF (Sign/Print Name) Date 1/2/92

CONSTRUCTION DATA Description	Diagram	Depth in Feet	GEOLOGIC/HYDROLOGIC DATA Graphic Log	Lithologic Description	
12" CASING SET @ 10.09' BLS		5.0		SILTY SANDY GRAVEL / SILTY SANDY GRAVEL	5
T-304 S.S. 4" ID casing		10.0		SANDY GRAVEL	10
Type I & II Portland cement.		15.0		SANDY GRAVEL	15
20.5 - 1.5'		20.0		SANDY GRAVEL	20
		25.0		SANDY GRAVEL	25
		30.0		SANDY GRAVEL	30
		35.0		GRAVEL	35
8-20 mesh. Bent. Crumbles.		40.0		GRAVEL	40
55.5-20.5		45.0		GRAVEL	45
		50.0		GRAVEL	50
3/8" Bent Pellets - 59.3-55.5		55.0		SANDY GRAVEL	55
		60.0		SANDY GRAVEL	60
	65.5'	65.0		GRAVEL	65
10-20 Sand 83 - 59.3		70.0		GRAVEL	70
		75.0		GRAVEL	75
10" CASING SET @ 85.01' BLS		80.0		GRAVEL	80
T-304 S.S. wire wrap		85.0		SANDY GRAVEL	83
20 slot screen set at 82.25	TD 84.09'				
Stiff					

A-6000-384 (04/90)

WHC-SD-EN-DP-040, Rev. 0

WELL CONSTRUCTION REPORT

VALIDATED KDR 2/19/92 SIGNATURE/DATE

Specification No. WHC-S-014 Rev No. 5/6 10/2/91

ECNs 144240, 144241, 127437/150132, 164223, 127437

Project 100-N, 1324-N/NA FACILITY AND 1325-N FACILITY

Location 100-N AREA

Drilling Company KEH

Driller JOE OCCERT, G. HOWEL

Other (Companies) WHC, EBASCO

Geologist(s) WILLIAM C. BRENNAN - EBASCO
Dennis J. Anderson - Salem
R. Weingart, J.A. COMES

Well No. 199-N-72 Temp. Well No.

Coordinates N: 149,249.91 E 571,302.37

Casing Elev. 458.49' Ground Elev. 455.59' Brass cap

Drilling Method

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 5.2, 5.3, 7.5, EII 6.7 Sec 6.2

			Initials	Date
Rotary	Air —	Mud —	—	NA
Cable Tool	D ✓	H ✓	WCB	091291
Drilling Fluid	RAW H_2O	73 GAL	WCB	090391
Other	—	—	—	—

Geophysical Logging

Sondes	Interval	Date
GROSS GAMMA	29' - 82.9'	091691
	-	
	-	
	-	
	-	

Completion Data

Drilled Depth 84.09' BLS

Completed Depth 82.25'

Date Started 10-30-91

Date Completed 10/30/91

Static Water Level/Date 65.1' 10-25-91

Aquifer Testing

Type INSTANTANEOUS SLUG

Flow Meter I.D. No. NA

Cal. Due Date NA

Length of Test 1 HR

Volume Pumped NA

Drawdown NA

Date of Test 11-7-91

Completion Results

Cleaning

Verification Method VISUAL INSP. & DIRECT OBS. OF DOC.

Criteria WHC-S-014 4.2.2, 7.6, 7.7; WAC-CM 7.7

	Initials	Date
Drilling Tools/Rig	WCB ③	08 30 91
Temporary Materials	WCB ④	090391
Permanent Materials	MW	10-30-91

Material Storage/Packing

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 4.2.2, 7.3

	Initials	Date
Mtl. Handling/Storage	RWJ	10-30-91
Material Packing	MW	10-30-91

Lubricants/Additives

Verification Method VISUAL OBSERVATION ①

Criteria WHC-S-014 7.2

	Identify	Initials	Date
Additives	RAW H_2O ①	WCB	090491
Lubricants	WELLGALIED ②	WCB	090391

Screen

Type	Length	Slot Size
WIRE WRP - T304 STAINLESS 4"ID	21.03'	20'

Depth(s) 82.25 - 61.22

Verification Method STEEL TAPE MEASUREMENT

Criteria WHC-S-014 4.2.3, 4.2.5, 12.2.1, 4.2.1

Initials MW Date 10-30-91

Straightness Test

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 8.2

Initials WCB Date 091291

A-6000-436 (09/90)

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WELL CONSTRUCTION REPORT
(continuation sheet)

Well # 199-N-72

Casing (permanent)

Type	Size	Placement
T304SS.	4" ID	6.22 - -2.10
		-
		-
		-

Verification Method MEASURING USING STEEL TAPE

Criteria WHC-S-014 4.2.1, 4.2.4, 4.2.5, 12.2.1

Initials AW Date 10-30-91

Well Protection

Verification Method VISUAL INSPECTION W/ TAPE

Criteria WHC-S-014 4.2.10

	Initials	Date
Protective Posts	ECL	1/24/92
Protective Casing	ECL	1/24/92
Site Restored	ECL	1/24/92
Cap, Hasp and Lock	ECL	1/24/92
Surface Pad	ECL	1/24/92

Annular Seal/Filter Pack

Verification Method MEASURING USING STEEL TAPE Criteria WHC-S-014, 4.2.6, 4.2.7, 4.2.8, 4.2.9, 5.3.1

Type	Interval	Volume	Initials	Date
10-20 Sand	83.0 - 59.3	12 PLUS 2/3/92 13 bags 13.4ft³	AW	10-30-91
3/8" Bent. Pellets.	59.3 - 55.5	3 buckets 1.9ft³	AW	10-30-91
8-20 mesh Bent crumbles.	55.5 - 20.5	33 sacks 23.4ft³	AW	10-30-91
Type I & II Portland Cement	20.5 - 1.6	15 sacks 19.3ft³	AW	10-30-91

Well Survey/Labeling

Verification Method REVIEW OF SURVEY REPORT

Criteria WHC-S-014 3.4

	Initials	Date
Measurement Point/Surveyed	ECL	1/24/92
Protective Casing/Brass Cap Surveyed	ECL	1/24/92
Well Number Stenciled	ECL	1/24/92
Brass Cap Labeled	ECL	1/24/92

Pump Installation

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 - 4.2.11, 4.2.2

	Initials	Date
Pump Decon/Prep	JAC	11/8/91
Installed	JAC	11/8/91
Pump Tested	JAC	11/8/91

Other (initial if performed)

NA Well Abandonment NA Downhole TV Inspection ECL Complete As-Built Diagram, Driller's/Geologist's Logs

JAC 11-8-91 Well Development

Comments/Remarks (1) RAW H2O ADDED: 19 GAL - 090391, 30 GAL - 090591, 10 GAL - 090691, 3 GAL - 090991, 1 GAL - 091091, 10 GAL - 091191

(3) DECON OF TOOLS / RIG: RIG, TOOLS 082991; ~~CASING~~ 081991 REPLACEMENT RIG 090391

(1) DECON OF TEMP CASING: CASING 081991

(2) WELL GUARD USED: 090391, 090491, 090691, 091191, 091291

Reviewed By (Sign/Print Name) Edward C. LaFave / EDWARD C. LAFAVE Date 2/13/92

A-6000-436 (09/90)

BOREHOLE LOG

VALIDATED KDR 2/19/92 SIGNATURE/DATE

Boring or Well No. 199-N-72

Sheet 1 of 5

Location 100-N AREA

Project 100-N, 1324-N/NA FACILITY AND 1325 N FACILITY

Elevation 455.59' BRASS CAP

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By WILLIAM C. BRENNAN (Sign/Print Name) Date 090491

Reviewed By R.D. Mc Ghee (Sign/Print Name) Date 9/13/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
0.0	1 RAD 1 $CaCO_3$/Moist 2 LITH	SHOVEL		0.0 SILTY SANDY GRAVEL (15% SILT, 40% SAND, 45% GRAVEL) 100% SILT - 10% VCS, 15% CS, 25% MS, 25% FS, 25% VFS - 20% SC, 20% VCP, 20% CP, 15% MP, 15% FP, 10% VFP. 2.5Y 6/3 LGT YELLOWISH BROWN (DRY), 2.5Y 4/3 DARK GRAYISH BROWN (WET). SAMPLE IS DRY. POORLY SORTED, SUBANGULAR TO SUBROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 70% BASALT, 15% GRANITE/PORPHRY, 15% QTZ/QTZE. NO RXN TO 10% HCL NON PLASTIC	SAMPLE COLLECTED 090491 @ 0745 19-GAL RAW H_2O ADDED 090491
5.0	1 RAD 1 $CaCO_3$ 2 LITH	HT		5.0 SANDY GRAVEL (20% SAND, 80% GRAVEL, TR SILT) 20% VCS, 20% CS, 20% MS, 20% FS 20% VFS - ?? 20% SC, 20% VCP, 20% CP, 15% MP, 15% FP, 10% VFP ?? 5Y 3/1 VERY DARK GRAY (WET), 5Y 4/1 DARK GRAY (DRY). SAMPLE IS WET. MODERATELY TO POORLY SORTED. SUBANGULAR TO ROUNDED, SUBPRISMOIDAL TO SUBDISCOIDAL. 90% BASALT 5% GRANITE/PORPHRY, 5% QTZ/QTZE/CHERT. NO RXN TO 10% HCL	SAMPLE COLLECTED 090591 @ 0825 DESCRIPTION IS BEST ESTIMATE OF INSITU MATERIAL. ESTIMATE BASED ON SURFACE SAMPLE AND ACTUAL 5' SAMPLE MATERIAL. LARGEST SIZE IN ACTUAL SAMPLE IS MP 30-GAL RAW H_2O ADDED 090591
10.0	1 RAD 1 $CaCO_3$ 2 LITH	HT		10.0 SANDY GRAVEL (30% SAND, 65% GRAVEL, 5% SILT). 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS - ?? 20% SC, 20% VCP, 20% CP, 15% MP, 10% VFP ??. 2.5Y 3/0 VERY DARK GRAY (WET), 2.5Y 4/0 DARK GRAY (DRY). SAMPLE IS WET. POORLY SORTED. SUBANGULAR TO ROUNDED, SUBPRISMOIDAL TO SUBDISCOIDAL. 90% BASALT, 5% GRAN/PORPH/FELSITE, 5% QTZ/QTZE. NONE TO WEAK RXN TO 10% HCL - NO MAG MAT'L.	SAMPLE COLLECTED 090691 @ 0850 DESCRIPTION IS BEST ESTIMATE OF INSITU MATERIAL. LARGEST PARTICLE SIZE IN HT SAMPLE IS CP.
15.0	1 RAD 1 $CaCO_3$ 2 LITH	HT		15.0 SANDY GRAVEL - DESCRIPTION SAME AS ABOVE. NO RXN TO 10% HCL, SOME MAG MAT'L	SAMPLE COLLECTED 090691 @ 1100

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BOREHOLE LOG

Boring or Well No. 199-N-72

Sheet 2 of 5

Location 100-N AREA

Project 100-N, 1324-N/NA FACILITY AND 1325-N FACILITY

Elevation 455.59 BPMS Cg

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By [signature] (Sign/Print Name) WILLIAM C. BRENNAN Date 090691

Reviewed By [signature] (Sign/Print Name) Date 9/13/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
20.0	1 RAD 1 CaCO3 2 LITH 1 CHEM (TAG # B0117)	DB		20.0 SANDY GRAVEL (25% SAND, 75% GRAVEL, TR. SILT) 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS – 20% SC, 25% VCP, 15% CP, 15% MP, 15% FP, 10% VFP. 5Y 4/1 DARK GRAY (DRY), 5Y 3/1 VERY DARK GRAY (WET). SAMPLE IS MOIST, POORLY SORTED. SUBANGULAR TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 95% BASALT, 5% QTZ/QTZE/CHERT/GRAN/PORPH. NO RXN TO 10% HCL. V. LITTLE TO NO MAG MAT'L.	SAMPLE COLLECTED 070691 @ 1420 10-GAL RAW H_2O ADDED 070691
25.0	1 RAD 1 CaCO3 2 LITH	DB		25.0 SANDY GRAVEL (25% SAND, 75% GRAVEL) 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS – 10% SC, 15% VCP, 20% CP, 20% MP, 10% FP, 10% VFP. 5Y 3/1 GRAY (DRY), 5Y 3/1 V DARK GRAY (WET). SAMPLE IS MOIST. POORLY SORTED, SUBANGULAR TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 95% BASALT, 5% QTZ/QTZE/CHERT/GRAN/PORPH. LITTLE TO NO RXN TO 10% HCL. V. LITTLE MAG MAT'L.	SAMPLE COLLECTED 070991 @ 1200
30.0	1 RAD 1 CaCO3 2 LITH 1 CHEM (TAG # B0119)	DB		30.0 SANDY GRAVEL (25% SAND, 75% GRAVEL) 20% VCS, 25% CS, 25% MS, 20% FS, 10% VFS – 15% SC, 20% VCP, 25% CP, 25% MP, 10% FP, 5% VFP. 5Y 5/1 GRAY (DRY), 5Y 3/1 V. DARK GRAY (WET). SAMPLE MOIST. POORLY SORTED, SUBANGULAR TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 90% BASALT, 10% GRAN/PORPH. LITTLE TO NO RXN TO 10% HCL. SOME MAG MAT'L	SAMPLE COLLECTED 070991 @ 1515
35.0	1 RAD 1 CaCO3 2 LITH	DB		35.0 GRAVEL (10% SAND, 90% GRAVEL) 20% VCS, 25% CS, 25% MS, 20% FS, 10% VFS – 25% SC, 25% VCP, 20% CP, 10% MP, 10% FP, 10% VFP. 5Y 5/1 GRAY (DRY), 5Y 3/1 V. DARK GRAY (WET). SAMPLE MOIST. POORLY SORTED, SUBANGULAR TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 85% BASALT, 10% GRAN/PORPH, 5% QTZ/QTZE. WEAK TO NO RXN TO 10% HCL. SOME MAG MAT'L	SAMPLE COLLECTED 070991 @ 1600

A-6000-382 (04/90)

BOREHOLE LOG

Boring or Well No. 199-N-72

Sheet 3 of 5

Location 100-N AREA

Project 100-N 1324-N/NA FACILITY AND 1325-N FACILITY

Elevation 455.59' Brass Cap

Drilling Contractor KEH

Driller Joe Ochert

Drilling Method and Equipment CABLE TOOL Bucyrus Erie 22-W

Prepared By William C Brennan (Sign/Print Name) Date 090791

Reviewed By R.D. Miller (Sign/Print Name) Date 9/13/91

Depth (Feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
40.0	1 RAD 1 CaCO3 2 Lith 1 Chem (TAG # B011V1)	DB		40.0 GRAVEL (15% SAND, 85% GRAVEL) 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS - 35% VCP, 20% CP, 15% MP, 15% FP, 15% VFP. 5Y5/1 GRAY (DRY), 5Y3/1 V. DARK GRAY (WET). SAMPLE MOIST. MODERATELY SORTED. SUBROUNDED TO ROUNDED, SPHERICAL TO SUBPRISMOIDAL - 70% BASALT, 10% GRAN/ARGILL/QTZ/QTZE. WEAK TO NONE RXN TO 10% HCL. SOME MAG MAT'L.	SAMPLE COLLECTED 090791 @ 1630 3-GAL RAW H2O ADDED 09 09 91
45.0'	1 RAD 1 CaCO3 2 Lith			45.0 GRAVEL (15% SAND, 85% GRAVEL) 20% VCS, 30% CS, 35% MS, 10% FS, 5% VFS - 15% SC, 15% VCP, 20% CP, 30% MP, 10% FP, 10% VFP. 5Y5/1 GRAY (DRY), 5Y3/1 V. DARK GRAY (WET). SAMPLE MOIST. MODERATELY SORTED. SUBROUNDED TO WELL ROUNDED, SPHERICAL TO SUBPRISMOIDAL. 90% BASALT, 10% GRAN/QTZ/QTZE. NO RXN TO 10% HCL. SOME MAG MAT'L.	SAMPLE COLLECTED 091091 @ 1020
50.0'	1 RAD 1 CaCO3 2 Lith 1 Chem (TAG # B011V2)			50.0 GRAVEL (10% SAND, 90% GRAVEL) 20% VCS, 30% CS, 35% MS, 10% FS, 5% VFS - 10% LC, 10% SC, 10% VCP, 15% CP, 30% MP, 15% FP, 10% VFP. 5Y5/1 GRAY (DRY), 5Y3/1 V. DARK GRAY (WET). SAMPLE MOIST MODERATELY SORTED. SUBROUNDED TO WELL ROUNDED, SPHERICAL TO SUBPRISMOIDAL. 90% BASALT, 10% GRAN/QTZ/QTZE. NO RXN TO 10% HCL. SOME MAG MAT'L.	SAMPLE COLLECTED 091091 @ 1100 PROMINENT COLOR CHANGE @ 54.5-54.9' b/s
55.0'	1 RAD 1 MOIST 2 Lith	DB		55.0 Sandy GRAVEL (10% sand 90% GRAVEL) 25% VCS 20% CS, 20% MS, 15% FS 20% VFS w/rock fbur - 5% LC 10% SC 20% VCP, 20% CP, 15% MP, 15% FP, 15% VFP w/chips, 2.5Y 1/2 dk gray brn WET, 2.5Y 6/2 lt brn gray - DRY, slightly moist. poorly sorted, sub-rnd - well rnd / discoid - spherical, 80% basalt 10% Qtz, 10% vol grph gran, No Rxn to 10% HCl, Nonplastic ph is 7, slight magnetite to .5mm	sample collected 9/10/91 @ 1425

A-6000-382 (04/90)

BOREHOLE LOG

Boring or Well No. 199-N-72

Sheet 4 of 5

Location 100N - Area

Project 100N-1324-N/NA Facility and 1325-N Fac.

Elevation 455.54 Bmss Cap

Drilling Contractor KEH

Driller Joe Ockert

Drilling Method and Equipment CABLETOOL - BUCYRUS ERIE

Prepared By Dennis Anderson (Sign/Print Name) DENNIS ANDERSON Date 9/10/91

Reviewed By R.D. Miller (Sign/Print Name) Date 9/13/91

William C. Brennan WILLIAM C. BRENNAN

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
60.0'	1 RAD 1 moist 2 lith 1 clam (B011V3)	DB		60.0 sandy GRAVEL (15% sand - 85% GRAVEL) desc same as 55.0' sample 2.5y 4/2 dk gry brn WET, 2.5y 6/2 lt brn gray - Dry, moist, poorly sorted, subrnd - wellrnd / discoidal - spherical. 85% basalt, ~10% qtz, ~10% rolporph, magnetite to 1mm, Non plastic,	Sample collected 9/10/91 @ 15:15 1 - Gal Raw H_2O added 091091
				ph is 7.0	
65.0	1 Rad 1 $CaCO_3$ 2 Lith	DB		65.0 GRAVEL (15% SAND, 85% GRAVEL) 10% VCS, 10% CS, 50% MS, 15% FS, 15% VFS, Some SILT - 10% SC, 10% VCP, 40% CP, 20% MP, 10% FP 10% VFP. 2.5Y 5/2 GRAYISH BROWN (WET), 2.5Y 6/3 Lt YELLOWISH BROWN (DRY). SAMPLE WET. POORLY SORTED. SUBROUNDED TO WELL ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 40% BASALT, 30% QTZ/QTZE, 30% GRAN/PORPH/RHYOLITIC MATERIAL - GRAVEL FRACTION, 70% QTZ/QTZE, 30% BASALT - SAND FRACTION. WEAK RXN TO 10% HCL. NO MAG MAT'L.	SAMPLE COLLECTED 091191 @ 0930
70.0	1 Rad 1 $CaCO_3$ 2 Lith	HT		70.0 GRAVEL (15% SAND, 85% GRAVEL) DESCRIPTION SAME AS 65.0' SAMPLE 2.5Y 4/2 DARK GRAYISH BROWN (WET), 2.5Y 6/2 LT BROWNISH GRAY (DRY). SAMPLE WET. POORLY SORTED. SUBROUNDED TO WELL ROUNDED. SUBDISCOIDAL TO SUBPRISMOIDAL. 40% BASALT, 30% QTZ/QTZE, 30% GRAN/PORPH/RHYOLITIC MAT'L. WEAK RXN TO 10% HCL. NO MAG MAT'L.	SAMPLE COLLECTED 091191 @ 1530 DESCRIPTION IS BEST ESTIMATE OF IN SITU MATERIAL. LARGEST PARTICLE SIZE IN HT SAMPLE IS MP.
75.0	1 Rad 1 $CaCO_3$ 2 Lith	HT		75.0 GRAVEL (15% SAND, 85% GRAVEL) DESCRIPTION SAME AS 65.0' SAMPLE AND 70.0' SAMPLE	SAMPLE COLLECTED 091191 @ 1635 DESCRIPTION IS BEST ESTIMATE OF IN SITU MATERIAL. LARGEST PARTICLE SIZE IN HT SAMPLE IS MP
					10 - Gal Raw H_2O added 091191

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BOREHOLE LOG

Boring or Well No. 199-N-72

Sheet 5 of 5

Location 100-N AREA

Project 100-N, 1324-N/NA FACILITY AND 1325-N FACILITY

Elevation 455.59' Brass Cap

Drilling Contractor KEH

Driller JOE OCKERT

Drilling Method and Equipment CABLE TOOL BUCYRUS ERIE 22-W

Prepared By William C. Sienna (Sign/Print Name) WILLIAM C. SIENNA Date 09/29/91

Reviewed By L.D. Miller (Sign/Print Name) Date 9/13/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
80.0	1 RAD 1 $CaCO_3$ 2 LITH	DB/HT		80.0 GRAVEL (15% SAND, 85% GRAVEL) 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS - 10% SC, 25% VCP, 10% CP, 30% MP, 15% FP, 10% VFP. 2.5Y 6/3 LIGHT YELLOWISH BROWN (DRY), 2.5Y 4/2 DK GRAYISH BROWN (WET). SAMPLE WET. POORLY SORTED. SUBROUNDED TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 60% BASALT, 25% EPIDOTE/OLIVINE/CHLORITE? CONTAINING ARTICLES, 10% QTZ/QTZE, 5% GRAN/RHYOLITE. WEAK TO NO RXN TO 10% HCL. V. LITTLE MAG MAT'L	SAMPLE COLLECTED 091291 @ 1200 SAMPLE MATERIAL WORKED W/ HT AND COLLECTED W/ DB. LARGEST PARTICLE SIZE IN SAMPLE MATERIAL IS SC. DESCRIPTION IS BEST ESTIMATE OF INSITU MATERIAL.
82.0	1 RAD 1 $CaCO_3$ 2 LITH	ST 19/6" BLOWS 40/6" 100/3" RECOVERY: 4/4 HT		82.0 - 82.4 GRAVELLY SAND (20% GRAVEL, 80% SAND) 20% VCP, 30% CP, 25% MP, 15% FP, 10% VFP - 10% VCS, 10% CS, 40% MS, 30% FS, 10% VFS. 2.5Y 4/2 DK GRAYISH BROWN (WET), 2.5Y 5/2 GRAYISH BROWN (DRY). SAMPLE WET. WELL SORTED. SUBANGULAR TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 55% QTZ/QTZE, 40% BASALT, 5% GRANITIC MAT'L. NO RXN TO 10% HCL. V. LITTLE MAG MAT'L.	1ST SAMPLE COLLECTED 091291 @ 1500 82.0 - 82.4 MAT'L MAY BE MATERIAL THAT WAS IN SUSPENSION AND SUBSEQUENTLY SETTLED OUT
83.0				82.4 - 83.0 SANDY GRAVEL (20% SAND, 80% GRAVEL) 20% VCS, 20% CS, 20% MS, 20% FS, 20% VFS - 35% SC, 20% VCP, 20% CP, 10% MP, 10% FP, 5% VFP. 2.5Y 4/2 DK GRAYISH BROWN (WET), 2.5Y 5/2 GRAYISH BROWN (DRY). SAMPLE WET. POORLY SORTED. SUBANGULAR TO ROUNDED, SUBDISCOIDAL TO SUBPRISMOIDAL. 55% QTZ/QTZE, 40% BASALT, 5% GRANITIC MAT'L. NO RXN TO 10% HCL. V. LITTLE MAG MAT'L	
84.0				83.0 - 84.0 SAME AS ABOVE	TOTAL DEPTH OF HOLE = 84.1' BLS

A-6000-382 (04/90)

100-N FACILITY

WELL 199-N-72

DRILLING

START DATE	FINISH DATE	TOTAL DAYS	CURRENT DEPTH	FINAL DEPTH	DEPTH TO WATER	WATER ADDED(GAL)
083091	091691	10	N/A	84.1	091191 64.8' 091291 63.9' PM 75.2' 091691 71.7'	7.3 GALLONS

DOWN HOLE COMPLETION

START DATE	FINISH DATE	TOTAL DAYS	DEPTH TO WATER	DEPTH TO BOTTOM	DEPTH OF SCREEN	WATER ADDED/ REMOVED (GAL)
102591	103091	4	102591 65.1'	82.9	~~63.2 - 83.9'~~ * PWA 61.22 - 82.25 2/8/92 * TO 84.2' W/END CAP	30 GALLONS TO DEVELOP SILICA SAND

DEVELOPMENT AND ASSOCIATED ACTIVITIES

TV CAMERA DATE	AQUIFER TEST DATE	DEVELOPMENT DATE	HYDROSTAR PLACEMENT DATE	WATER REMOVED(GAL)
N/A	110791	110791	110891	6325

COMMENTS:

VALIDATED
KDR 2/19/92
SIGNATURE/DATE

19

WELL CHECK LIST

Well Number: 199-N-72 Location: 100 N (91)

Date: 1/24/92

	Yes	No
Hasp on protective casing	✓	
Lock	✓	
Proper cap fit	✓	
Well ID number on brass cap	✓	
Protective post painted	✓	
Well ID number stenciled on post	✓	
Well ID number stenciled on protective casing	✓	
Survey mark on casing	✓	
Stock tank		✓
Site neat	✓	

Comments:

Signature: Edward C. Rafn Date: 1/24/92

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WELL 199-N-73

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WELL SUMMARY SHEET

Boring or Well No. 199 N-73

Sheet 1 of 1

Location 1324 N Facility - 100 N area

Project W217 - 100N

Elevation 459.98 Brass Cap

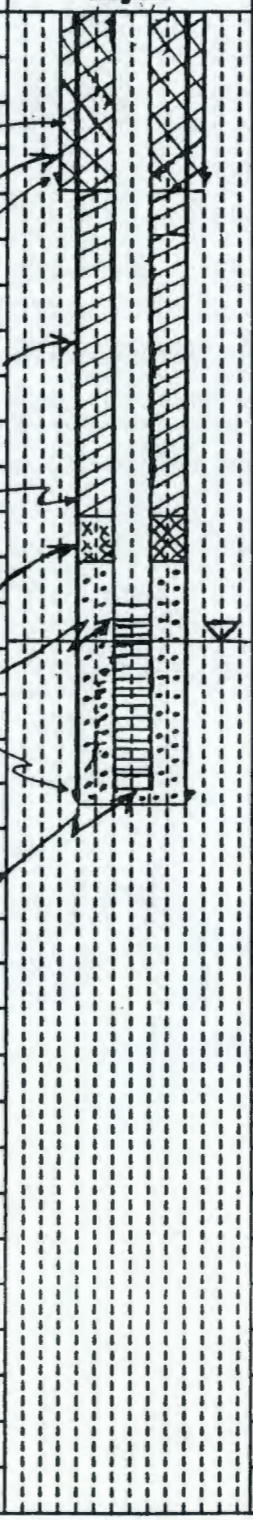
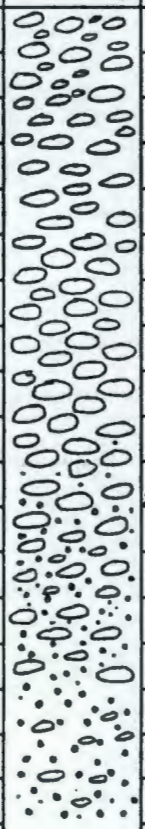
Drilling Contractor KEH

Driller Don Kruger

Drilling Method and Equipment CABLETOOL - Bucyrus Erie

Prepared By Dennis Anderson (Sign/Print Name) Date 8/26/91

Reviewed By _____ (Sign/Print Name) Date _____

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
12" temporary carbon steel casing to 19.92' bls		5		GRAVEL
		10		"
		15		"
		20		"
~~0.~~ 2.0-19.7' Cement Grout		25		"
12" shoe diameter = 1.10' ⌀		30		"
		35		"
19.7'-55.5' Bentonite Crumbles		40		"
		45		"
		50		"
10" temporary carbon steel casing to 86.99' bls		55		sandy GRAVEL
		60		" "
55.6'-60.5' Bentonite Pellets		65		" "
STATIC WATER LEVEL 68.6' bls		70		" "
Top of Screen ~ 65.6' bLS		75		" " gravelly sand @ 72.1' bls to 73.6'
10" shoe diameter = .96' ⌀		80		
60.5'-87.4' 10-20 Filter Pack		85		sandy GRAVEL
Total depth 89.1' bls		90		
Bottom of Screen ~ 86.1' bLS				
Bottom of Well ~ 86.4' bls				
SWL ~ 69.3' bLS 10-30-91				

9413224.0043

A-6000-384 (04/90)

WELL CONSTRUCTION REPORT

KDR 2/19/92

Specification No. WHC-S-014 Rev No. 5

ECNs 144240, 144241, 127437

Project RCRA W017 / 100N

Location 1325-N Facility - 100 N Area

Drilling Company KEH

Driller Don Kruger

Other (Companies) WHC, HEPCO, SALEM, HEAT CROWSER

Geologist(s) Dennis Anderson - SALEM
Robert Winn - HEPCO
William C. Brennan - EBASCO
Ken Lane - HC, J.A. Coates

Well No. 199-N-73 Temp. Well No.

Coordinates N: 149,169.25 E 571,302.37 E 571,262.22

Casing Elev. 463.28' Ground Elev. 459.98' Bldg Grp

Drilling Method

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 5.2, 5.3, 7.5; EII 6.7 Sec 6.2

			Initials	Date
Rotary	Air N/A	Mud N/A	N/A	N/A
Cable Tool	D	H 0'-89.1'	DJA	9/9/91
Drilling Fluid *	raw H_2O	335 GAL	DJA	8/26/91
Other *	wellguard		DJA	8/26/91

Geophysical Logging

Sondes	Interval	Date
Gross Gamma	2.9' - 86.7 BLS	09/6/91
	-	
	-	
	-	
	-	

Completion Data

Drilled Depth 89.1' bls 9/9/91

Completed Depth 86.1'

Date Started 8/26/91

Date Completed 10/31/91

Static Water Level/Date 69.3' 10-30-91
68.2' 9/16/91

Aquifer Testing

Type INSTANTANEOUS SLUG

Flow Meter I.D. No. -NA-

Cal. Due Date -NA-

Length of Test 1 HR

Volume Pumped -NA-

Drawdown -NA-

Date of Test 11/6/91

Completion Results

Cleaning

Verification Method Visual Insp. & Direct obs of Doc.

Criteria WHC-S-014 4.2.2, 7.6, 7.7, WAC-CM 7.7

	Initials	Date
Drilling Tools/Rig	DJA	8/26/91
Temporary Materials	DJA	9/9/91
Permanent Materials	K.L.	10-30-91

Screen

Type	Length	Slot Size
304 STAINLESS	2(10') SECTIONS 20.74' w/o END CAP 21.02' w/ END CAP	20 SLOT

Depth(s) 65.4' - 86.1' bls

END CAP 86.1' - 86.4'

Verification Method Steel tape measurement

Criteria WHC-S-014 4.2.3, 4.2.5, 12.2.1, 4.2.1

Initials K.L. Date 10-31-91

Material Storage/Packing

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 4.2.2, 7.3

	Initials	Date
Mtl. Handling/Storage	KDR	10/10/91
Material Packing	K.L.	10-31-91

Lubricants/Additives

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 7.2

	Identify	Initials	Date
Additives *	RAW H_2O	DJA	8/26/91
Lubricants *	WellGuard	DJA	8/26/91

Straightness Test

Verification Method Visual Observation

Criteria WHC-S014 8.2

Initials DJA KEH Date 9/9/91

A-6000-436 (09/90)

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WELL CONSTRUCTION REPORT
(continuation sheet)

well 199-N-73

Casing (permanent)

Type	Size	Placement
T-304 STAINLESS 20 SLOT	4"	65.4 - 86.4
T-304 STAINLESS BLANK	4"	-50 AGL - 65.4' bls
		-
		-

Verification Method: Measuring using steel tape

Criteria: WHC-S-014 4.2.1, 4.2.4, 4.2.5, 12.2.1

Initials: K.L. Date: 10-30-91

Well Protection

Verification Method: Visual Insp w/ tape

Criteria: WHC-S-014 4.2.10

	Initials	Date
Protective Posts	ECL	1/24/92
Protective Casing	ECL	1/24/92
Site Restored	ECL	1/24/92
Cap, Hasp and Lock	ECL	1/24/92
Surface Pad	ECL	1/24/92

Annular Seal/Filter Pack

Verification Method: Measuring using steel tape Criteria: WHC-S-014 4.2.6, 4.2.7, 4.2.8, 4.2.9, 5.3.1

Type	Interval	Volume	Initials	Date
SAND 10-20	87.4' - 60.5	1600lb 16 sacks	K.L.	10-31-91
BENTONITE PELLETS	60.5 - 55.5	200lb 4 buckets	K.L.	10-31-91
BENTONITE CRUMBLES	55.5' - 19.7'	1500lb 30 bags	K.L.	10-31-91
CEMENT GROUT	19.7' - 2.0	452 lb 4 bags	K.L.	10-31-91

Well Survey/Labeling

Verification Method: Review of Survey Report

Criteria: WHC-S-014 3.4

	Initials	Date
Measurement Point/Surveyed	ECL	1/24/92
Protective Casing/Brass Cap Surveyed	ECL	1/24/92
Well Number Stenciled	ECL	1/24/92
Brass Cap Labeled	ECL	1/24/92

Pump Installation

Verification Method: VISUAL OBSERVATION

Criteria: WHC-S-014 4.2.11, 4.2.2

	Initials	Date
Pump Decon/Prep	JAC	11/6/91
Installed	JAC	11/6/91
Pump Tested	JAC	11/6/91

Other (initial if performed)

NA Well Abandonment NA Downhole TV Inspection Complete As-Built Diagram, Driller's/Geologist's Logs

JAC 11/6/91 Well Development

Comments/Remarks* WATER ADDED AS FOLLOWS: 8/26/91 - 20 gals, 8/27 - 40 gals, 8/28 - 30 gals, 8/29 - 30 gals, 8/30 - 70 gals, 9/3 - 50 gals, 9/4 - 35 gals, 9/5 - 20 gals, 9/6/91 - 40 gals; 9/9/91 - 0 gals TOTAL GALLONS RAW H_2O = 335

*Lube added on 8/26/91; 9/6/91; 9/9/91

Reviewed By (Sign/Print Name) Edward C. Rafuse / EDWARD C. RAFUSE Date 2/13/92

A-6000-436 (09/90)

WHC-SD-EN-DP-040, Rev. 0

BOREHOLE LOG

KDR 2/19/92

Boring or Well No. 199-N-73

Sheet 1 of 5

Location 1324N / 100N Area

Project RCRA W017 / 100N

Elevation 459.98' Brass Cap

Drilling Contractor Kaiser

Driller Don Kruger

Drilling Method and Equipment CABLETOOL - Bucyrus Erie

Prepared By Dennis Anderson (Sign/Print Name) Date 8/26/91

Reviewed By R.D.M. Ker Rutgill (Sign/Print Name) Date 9/4/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
	1 rad 1 CaCO3 2 lith	HT		GRAVEL w/minor sand (98% GRAVEL <2% sand) GRAVELS are cp-vfp due to hardtool. sands are ms-vfs. 5Y 3/1 vydkgry WET, 5Y 5.5 grey DRY, sample is SAT due to ADD. of H2O, unable to det. sorting sample is ang-sub ang due to hard tool. 95% basalt, 5% Qtz gran. Non-plastic slight magnetic mat. to 1mm. No Rxn to 10% HCl,	5' sample - 8/26/91 @ 15:00
5.0'				ph is 6.5	
	1 RAD 1 CACO3 2 LITH	HT		GRAVEL w/minor sand (same desc as 5' sample) 5Y 3.5 dk-vydkgrey WET, 5Y 6/1 gray DRY, sample is SAT due to hard tool, sample ang is same as 5', Non plastic, 95% + basalt <5% Qtz gran, unable to det sorting due to hardtool	
					10' sample - 8/27/91 @ 1010
10.0'				ph is 7.5	
	1 RAD 1 CACO3 2 LITH	HT		GRAVEL w/MINOR SAND (~98% GRAVEL w/<2% SAND) GRAVELS ARE CP-VFP BECAUSE OF HT DRLG; SANDS ARE MS-VFS, 5Y 5.5 GRAY - DRY; 5Y 3/1 VERY DK GRAY WET, SAMPLE SAT BY DRLG FLUID, CAN NOT DETERMINE SORTING, ANG-SUB ANG DUE TO HT. MATERIAL IS >95% BASALT, <5% QTZ NON-PLASTIC, NO REACTION W/HCL	
15.0'				ph is 6.0	15' SAMPLE - 8/28/91 1020
	1-RAD 1-CACO3 2-LITH	HT		GRAVEL W/SOME SAND (~95% GRAVEL, 5% SAND), GRAVELS ARE CP-VFP (DUE TO HT DRLG), SANDS ARE MS-VFS; 5Y 3/1 VDK GRAY WET, 10YR 4/1 LT GRAY DRY, NON-PLASTIC ~90% BASALT, 10% QTZ, SORTING "NON EXISTENT, SAMPLES SAT. W/DRLG FLUID, NO REACTION TO 10% HCL	
20.0'				ph is 6.5	20' SAMPLE - 8/28/91

A-29

A-6000-382 (04/90)

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BOREHOLE LOG

WHC-SD-EN-DP-040, Rev. 0

Boring or Well No. 199-N-73

Sheet 2 of 5

Location 1324 N / 100 N AREA

Project RCRA W017/100 N

Elevation 459.48' Brass Cap

Drilling Contractor KAISER

Driller DON KRUGER

Drilling Method and Equipment CABLE TOOL - BUCYRUS ERIE

Prepared By (Sign/Print Name) ROBERT WINN Date 8/29/91

Reviewed By (Sign/Print Name) Date 9/4/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
	1-RAD 1-CaCO3 2-LITH	HT		GRAVEL W/SOME SAND (~95% GRAVEL & ~5% SAND), GRAVEL BY STREAM WEAR ~40% & BY CABLE TOOL CRUSHING; SIZE FROM CP-MG; 5Y 2.5/1 BLACK-WET, 2.5Y 6/2 GRAY-DRY; SAMPLE SAT. BY DRILLING FLUIDS; SORTING IS MIN., SAMPLES ARE SUB-ANG TO ANG., BASALT W/ ~2% QTZ, MINUTE VOL OF FINES - CLAYS, NON-PLASTIC	5' SAMPLE -- 8/29/91 @ 1020
25.0'				ph is 6.8	
	1-RAD 1-CaCO3 2-LITH	HT		GRAVEL W/MINOR SAND (~97% GRAVEL & 3% SAND), SAND IS CP-MP, SUB ROUNDED, GRAVEL IS COARSE TO MED. COARSE, BROKEN, ANGULAR DUE TO CABLETOOL, SOME SUB-RD 5Y 2.5/1 BLACK WET, 2.5Y 6/2 GRAY - DRY, SAMPLE SAT. W/DRLG FLUID, QTZ IS LT COLOR, POORLY SORTED, NON PLASTIC, NO REACTION TO HCL	5' SAMPLE -- 8/29/91 @ 1350
30.0'				ph is 7.0	
	1-RAD 1-CaCO3 2-LITH	HT		GRAVEL W/SMALL AMT SAND (>98% AS GRAVEL WHICH IS COARSE TO PEBBLE, ANGULAR), SAND IS ROUNDED, MED-W/ NO APPRECIABLE CLAY; 5Y 2.5/1 BLACK WET; 2.5Y 6/2 GRAY, DRY. SAMPLE SAT. W/DRLG FLUID, NO REACTION TO HCL; SAMPLE IDENTICAL TO 30' MATERIAL W/SUGGESTION THAT GRAVEL BROKEN BY DRLG FLUID IS FROM LARGER COBBLES	5' SAMPLE -- 8/29/91 @ 1500
35.0'				ph is 6.8	
	1-RAD 1-CaCO3 2-LITH	HT		GRAVEL, COARSE (40%) W/SAND, FINE-MED (~50%) W/SILT (10%), 2.5Y 2/2 BLACK WET, 2.5Y 6/2 GRAY, DRY; SANDS & GRAVELS ARE SAT. W/DRLG FLUID, TRACE SILT (10%) IS FIRST GOOD REFERENCE POINT; SOME QTZ PEBBLES (MED) W/ BASALT (90%) FINE-COARSE DUE TO BIT ACTION, NO REACTION TO HCL	5' SAMPLES -- 8/30/91 @ 1055
40'				pH is 7 A-30	

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BOREHOLE LOG WHC-SD-EN-DP-040, Rev. 0

Boring or Well No. 199-N-73

Sheet 3 of 5

Location 1324 N FACILITY - 100 N Area

Project RCRA WOIT / 100N

Elevation 459.98' Brass Cap

Drilling Contractor KEH

Driller Don Kruger

Drilling Method and Equipment CABLE TOOL - Bucyrus Erie

Prepared By Dennis Anderson DENNIS ANDERSON (Sign/Print Name) Date 8/30/91

Reviewed By R.D. Miller (Sign/Print Name) Date 9/7/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
45.0'	1rad 1CaCO3 2lith	HT		GRAVEL, Coarse (~50%) w/sand F-M (~50%), trace silt: soils class of 2.5y 2/2 BLACK WET, 2.5y 6/2 DRY, sample similar to 40' material, sat w/drilling fluid, Qtz pebbles and smaller cont. trend of 40' sample, sample pred. basalt. No Rxn to 10% HCl	45' sample 8/30/91 @ 1415
					45' recovered from R. Winn
					noticing minor sand @ 49+ feet
50.0'				ph is 7.0	
	1rad 1CaCO3 2lith	HT		sandy GRAVEL (10% sand 90% GRAVEL) 20% vcs, 20% cs, 25% ms, 15% fs, 20% vfs w/ poss. silt, from drilling - gravels under due to HT, 2.5y N3.5/0 vk dkgry WET, 2.5y N6.5/0 ltgry DRY, sat sample due to HT. sorting uniat, roundness under ingravels, sands are subang-rnd slight Rxn to 10% HCl, Non plastic slight mag to 1mm, 90% basalt, 10% Otz, Otz vol. poro ph is 7.0	50' sample 9/3/91 @ 0950 > sand. slow drill rate from 50'-55' b/s
55.0	1rad 1CaCO3 2lith	HT		sandy GRAVEL (10% sand 90% GRAVEL) 10% vcs, 15% cs, 25% ms, 25% fs, 25% vfs w/ minor silt from HT - 10% vcp, 10% cp, 25% mp, 30% fp, 25% vfp, 5y 3/1 vy dkgry WET, 5y 6.5/1 gry-ltgry DRY. sample sat. due to HT, mod sorted, rnd-wellrnd / discoidal-spherical, very slight Rxn to 10% HCl, Non-plastic, 90% basalt, 10% qtz, qtzE peg, mica, sscp, feld-, very slight mag mat. ph is 7.5	55' sample 9/3/91 @ 1410 used sand pump for sampling
60.0'	1rad 1CaCO3 2lith	HT		sandy GRAVEL (15% sand 85% GRAVEL) 10% vcs, 10% cs, 20% ms, 25% fs, 35% vfs - 10% vcp, 15% cp, 25% mp 20% fp, 30% vfp 5y 3.5/2 dkdgry-dgry WET, 5y 6/1.5 ltgry-ltdgry DRY, sat sample due to HT; mod-well sorted GRAVEL are subrnd-wellrnd / discoidal-spherical; sands are subrnd / sub discoidal, No Rxn to 10% HCl, 70% basalt 30% qtz, gran, qtzE, musc, flds, Non-plastic, slight mag. mat to 1mm, ph is 7.0.	60' sample 9/4/91 @ 1000 used sand pump for sampling

A-6000-382 (04/90)

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BOREHOLE LOG

Boring or Well No. 199-N-73

Sheet 4 of 5

Location: 1324 N Facility - 100N Area

Project: RCRA W017 / 100N

Elevation: 459.98 Brass Cap

Drilling Contractor: KEH

Driller: Don Kruger

Drilling Method and Equipment: CABLETOOL - Bucyrus Erie

Prepared By: Dennis Anderson (Sign/Print Name) Date 9/4/91

Reviewed By: R.D. Miller (Sign/Print Name) Date 9/7/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
65.0	1rad 1CaCO3 2lith	HT		Slightly sandy GRAVEL (20% sand - 80% GRAVEL) 10% vcs, 10% cs, 20% ms, 25% fs, 35% vfs, gravels are similar to 60' sample roundness, color, moisture are same as 60' sample, 20% Qtz, 10% Qtze, 20% gran, 20% diorites, 20% rol porph, 10% mus, Alb misc, Non plastic, magnetite mater 1/2 to 1mm,	65' sample - 9/4/91 @ 1100 using sand pump
70.0'				ph is 7.5	
	1rad 1CaCO3 2lith	HT		sandy GRAVEL (35% sand 65% GRAVEL) 10% vcs, 10% cs 30% ms, 30% fs, 30% vfs w/poss. drilling silt - 2% vcp, 13% cp 35% mp, 30% fp, 20% vfp, 5Y 4.5/2 olgry WET, 5Y 6.5/2 lt olgry Dry, sat sample, mod sorted, ang-rnd, very weak Rxn to 10% HCl, 25% basalt, 30% Qtze, 40% Qtz, 5% rol porph, w/ minor gran, Non-plastic, slight mag. to 1mm	70' sample 9/5/91 @ 1425 < gravels - > sands STATIC WATER level 9/6/91 @ 0725 is: 68.32' b/s
72.1'					
72.5	1rad 1CaCO3 2lith				
73.6'		ST 9hits-6" 50hits-6" 70hits-3"			split tube sample 0845 9/6/91 - 72.1'-73.6'
75.0	1rad 1CaCO3 2lith			ph is 7.5 gravelly SAND (40% gravel 60% SAND) 5% vcp, 10% cp, 10% mp, 20% fp, 55% vfp - 25% vcs, 20% cs, 20% ms, 10% fs 25% vfs w/poss. drilling flour-silt, 2.5Y 5.5/2 lt brngry WET, 2.5Y 7/2 ltgrey Dry, sat sample, mod sorted, rnd-well rnd, subdiscoidal-spherical-desc for both sands-gravels, very slight Rxn to 10% HCl, 80% Qtz, 10% basalt, 10% Qtze, Vol porph, gran, minor mus, Non-plastic, trace mag. mat. to 1mm	some cementation Noted @ 73.0-73.1' b/s w/ weak Rxn to 10% HCl prom. gravels @ 73.1'-73.6'
				ph is 7.5	
				slightly gravelly SAND (10% gravel - 90% SAND) 5% vcp 5% cp 30% mp, 30% fp, 30% vfp, 5% vcs 10% cs 30% ms, 35% fs 20% vfs, 2.5Y 5.5/2 lt olgry WET, 5Y 7/1.5 ltgry Dry, well sorted, gravels are subrnd-rnd, sands are subrnd No Rxn to 10% HCl, 70% Qtz, 20% basalt, 10% Qtze, Vol porph, Non-plastic, No mag.	75 sample - 9/6/91 @ 1045
80'					ph = 7.0

BOREHOLE LOG

Boring or Well No. 199-N-73

Sheet 5 of 5

Location 1324 N FACILITY - 100 N

Project RCRA W017 /100N

Elevation 459.98' Brass Cap

Drilling Contractor KEH

Driller Don Kruger

Drilling Method and Equipment CABLETOOL - Bucyrus Eric

Prepared By Dennis Anderson (Sign/Print Name) Date 9/6/91

Reviewed By [signature] (Sign/Print Name) Date 9/11/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
80.0'	1 rad 1 $CaCO_3$ 2 lith	HT		sandy GRAVEL (10% sand - 90% GRAVEL) 10% vcs, 10% cs, 30% ms, 30% fs 30% vfs, w/ pass drilling silt - 2% vcp, 8% cp, 40% mp, 30% fp, 25% vfp, 5y 5/2 olgr WET, 5y 7/2 ltgry DRY, sat sample, mod sorted, gravels are ang - subrnd/ discoidal - subdiscoidal. 30% basalt, 40% Qtz, 20% vol porph, 10% gran, Qtze Non-plastic, mag material to 1mm ph is 7.0	80. sample 9/9/91 @ 1025
85.0'	1 rad 1 $CaCO_3$ 2 lith	HT		sample dsc is same as 80.0' ph is 7.0	85 sample. 9/9/91 @ 1400
87.4'	1 rad 1 $CaCO_3$ 2 lith	ST		gravelly SAND (30% gravel - 70% SAND) 15% vcp, 10% cp, 25% mp, 20% fp, 30% vfp, - 10% vcs, 10% cs, 25% ms, 30% fs, 25% vfs, 5y 5/2 olgry WET, 5y 7/2 ltgry DRY sat sample, mod sorted, 20% basalt, 35% Qtz 25% vol porph, 10% Qtze, gran, 10% gran, Non plastic well-sorted, magnetite to 1mm ph is 7.0	Sand lense @ 87.6 - 88.2' bls Total depth 89.1' bls
89.1					
90					

A-6000-382 (04/90)

9413224.0050

100-N FACILITY

WELL 199-N-73

DRILLING

START DATE	FINISH DATE	TOTAL DAYS	CURRENT DEPTH	FINAL DEPTH	DEPTH TO WATER	WATER ADDED(GAL)
8-26-91	9-16-91	12	N/A	89.0	9-5-91 69.4' 9-6-91 68.3' 9-9-91 69.7' 9-10-91 68.6' 9-16-91 68.6'	~~265~~ 335

DOWN HOLE COMPLETION

START DATE	FINISH DATE	TOTAL DAYS	DEPTH TO WATER	DEPTH TO BOTTOM	DEPTH OF SCREEN	WATER ADDED/ REMOVED (GAL)
10-30-91	10-31-91	2	10-30-91 69.3'	87.4'	65.4' - 86.1' *	10 GALLONS ADDED 32 GALLON REMOVED TO DEVELOP FILTER PACK

* 96.4' W/END CAP

DEVELOPMENT AND ASSOCIATED ACTIVITIES

TV CAMERA DATE	AQUIFER TEST DATE	DEVELOPMENT DATE	HYDROSTAR PLACEMENT DATE	WATER REMOVED(GAL)
N/A	11-6-91	11-6-91	11-6-91	3282

COMMENTS:

~~1911~~
VALIDATED
KDR 2/19/92
SIGNATURE/DATE

WELL CHECK LIST

Well Number: 199 N-73 Location: 200N (91)

Date: 1/24/92

	Yes	No
Hasp on protective casing	✓	
Lock	✓	
Proper cap fit	✓	
Well ID number on brass cap	✓	
Protective post painted	✓	
Well ID number stenciled on post	✓	
Well ID number stenciled on protective casing	✓	
Survey mark on casing	✓	
Stock tank		✓
Site neat	✓	

Comments:

Signature: Edward C. Rafuse Date: 1/24/92

9112274.0052

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9413224.0054

WELL 199-N-74

394

WELL SUMMARY SHEET

Boring or Well No. 199-N-74

Sheet 1 of 1

Location 1325 N. Facility / 100 N Area

Elevation 458.14' Brass Cap

Driller Don Kruger

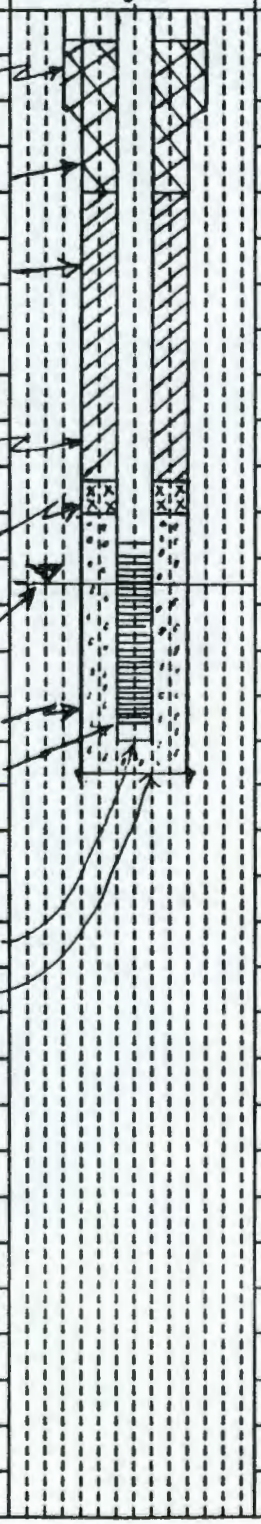
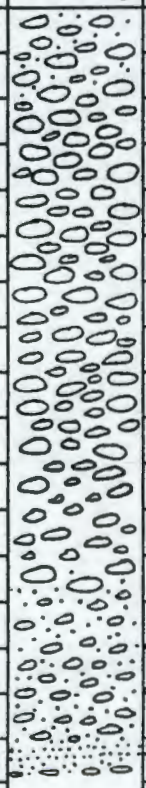
Prepared By Dennis Anderson (Sign/Print Name) Date 8/7/91

Project RCRA W017 / 100N

Drilling Contractor KEN

Drilling Method and Equipment CASLETOOL - Bucyrus Erie

Reviewed By Edward C. Rafuse (Sign/Print Name) Date 10/30/91

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
12" ID Temporary carbon steel casing to 10.15' bls (No shoe)		5		GRAVEL w/ trace sand
		10		" " "
		15		" " "
35'-20.2' cement grout		20		GRAVEL
20.2'-52.7' bentonite crumbles		25		"
		30		"
		35		"
		40		"
10" ID Temporary carbon steel casing to 84.0' bls		45		"
52.7'-55.8' bentonite pellets (3/8" & 1/4")		50		"
		55		"
		60		
Top of Screen ~59.0' bls		65		sandy GRAVEL
SWL ~62.5' bls 10-29-91 H.L.		70		sandy GRAVEL
55.8'-84.8' silica sand (20-40)		75		sandy GRAVEL
		80		" "
Bottom of Screen ~79.7' bls		85		SAND GRAVEL
T-304 stainless steel 4" casing w/ ~20 ft 10 slot screen				
Bottom of well ~80.0' bls				
T.D. Drilled 84.0'				

A-6000-384 (04/90)

9413224.0055

WELL CONSTRUCTION REPORT

VALIDATED KDR 2/19/92 SIGNATURE/DATE

Specification No. WHC-S-014 Rev No. 5

ECNs 144240, 144241, 127437

Project W017 / 100 N

Location 1325 N Facility - 100 N AREA

Drilling Company KEH

Driller Don Kruger; G. Howell

Other (Companies) WHC, SALEM TECH; Ebasco

Geologist(s) Dennis Anderson - Salem Tech
William C Brennan - Ebasco
R Weingart - (NYB)
Ken Lane (HC), J.A. Coates

Well No. 199-N-74 Temp. Well No.

Coordinates N: 149,156.41 E 571,942.09

Casing Elev. 457.66' Ground Elev. 454.14 Binsley

Drilling Method

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 5.2, 5.3, 7.5, EII 6.7 Sec 6.2

			Initials	Date
Rotary	Air NA	Mud NA	NA	NA
Cable Tool	D 0-10'	H 10'-84'	DJA	8/21/91
Drilling Fluid	RAW H2O	410 GAL	DJA	8/8/91
Other	—	—	—	NA

Geophysical Logging

Sondes	Interval	Date
GROSS GAMMA	83.4'-2.5 Hz	082991
	-	
	-	
	-	
	-	

Completion Data

Drilled Depth 84.0'

Completed Depth 84.0'

Date Started 8/8/91

Date Completed 082291

Static Water Level/Date 64.78' Hz 081991, 64.29' Hz 082091, 66.55' Hz 082191, 67.93' Hz 082291

Aquifer Testing

Type INDIVIDUAL SURGE

Flow Meter I.D. No. -NA-

Cal. Due Date -NA-

Length of Test 1 HR

Volume Pumped -NA-

Drawdown -NA-

Date of Test 11-4-91

Completion Results

Cleaning

Verification Method VISUAL INSP. & DIRECT OBS of doc.

Criteria WHC-S-014 4.2.2, 7.6, 7.7; WAC-CM-7.7 Sec 5.4

	Initials	Date
Drilling Tools/Rig	DJA	8/13/91
Temporary Materials	DJA	8/16/91 082291
Permanent Materials	K.L.	8/16/91

Screen

Type	Length	Slot Size
T-304 STAINLESS	2 (10' SECTIONS) 20.0' w/END CAP	10 SLOT

Depth(s) ~58.6' - 79.3'

Verification Method STEEL TAPE MEASUREMENT

Criteria WHC-S-014 4.2.3, 4.2.5, 12.2.1, 4.2.1

Initials K.L. for R.W. Date 10-29-91

Material Storage/Packing

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 4.2.2, 7.3

	Initials	Date
Mtl. Handling/Storage	K.L.	10-29-91
Material Packing	K.L.	10-29-91

Lubricants/Additives

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 7.2

	Identify	Initials	Date
Additives	RAW H_2O	DJA	8/8/91
Lubricants	Well guard	DJA	8/8/91

Straightness Test

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 8.2

Initials [illegible] Date 08/15/91

A-6000-436 (09/90)

2 of 4

WELL CONSTRUCTION REPORT
(continuation sheet)

Well # 199-N-74

Casing (permanent)

Type	Size	Placement
T-304	4" 10 SLOT	80 - 59'
T-304	4" blank	59' - -1.5' AGS
		-
		-

Verification Method MEASURING USING STEEL TAPE

Criteria WHC-S-014 4.2.1, 4.2.4, 4.2.5, 12.2.1

Initials K.L. Date 10-24-91

Well Protection

Verification Method VISUAL INSPECTION W/TAPE

Criteria WHC-S-014 4.2.10

	Initials	Date
Protective Posts	ECW	1/24/92
Protective Casing	ECW	1/24/92
Site Restored	ECW	1/24/92
Cap, Hasp and Lock	ECW	1/24/92
Surface Pad	ECW	1/24/92

Annular Seal/Filter Pack

Verification Method MEASURING USING STEEL TAPE Criteria WHC-S-014 4.2.6, 4.2.7, 4.2.8, 4.2.9, 5.3.1

Type	Interval	Volume	Initials	Date
SAND	84.2' - 55.8'	1600 lbs 16 SACKS	K.L	10-24-91
BENTONITE PELLETS	55.8' - 52.7'	150 lbs 3 buckets	K.L.	10-24-91
BENTONITE CRUMBLES	52.7' - 20.2	1400 lbs 28 bags K.L. ~~32 buckets~~ ~~K.L.~~ 10-24-91	K.L	10-24-91
CEMENT GROUT	20.2' - 35'	4794 lbs 51 SACKS K.L. ~~1410~~ ~~15 SACKS~~ 10-24-91	K.L.	10-24-91

Well Survey/Labeling

Verification Method REVIEW of survey report

Criteria WHC-S-014 3.4

	Initials	Date
Measurement Point/Surveyed	ECW	1/24/92
Protective Casing/Brass Cap Surveyed	ECW	1/24/92
Well Number Stenciled	ECW	1/24/92
Brass Cap Labeled	ECW	1/24/92

Pump Installation

Verification Method VISUAL OBSERVATION

Criteria WHC-S-014 4.2.11, 4.2.2

	Initials	Date
Pump Decon/Prep	JAC	11-4-91
Installed	JAC	11-4-91
Pump Tested	JAC	11-4-91

Other (initial if performed)

NA Well Abandonment NA Downhole TV Inspection (Rw) Complete As-Built Diagram, Driller's/Geologist's Logs

JAC 11-4-91 Well Development

Comments/Remarks WATER ADDED AS FOLLOWS 8/7/91 - 15 gals; 8/8/91 - 90 gals; 8/9/91 - 35 gals; 8/12/91 - 50 gals 08/13/91 - 30 GALS, 08/14/91 - 70 GALS, 08/15/91 - 60 GALS, 08/16/91 - 50 GALS, 08/19/91 - 10 GAL

SMALL CHIPS WERE NOTED IN 10" SHOE AS IT WAS WITHDRAWN

SOIL COLLAPSED ~9'-12.5' WITHIN CEMENT GROUT SEAL

Reviewed By (Sign/Print Name) Edward C. Rafuse / EDWARD C. RAFUSE Date 2/12/92

A-40

A-6000-436 (09/90)

9413224.0057

BOREHOLE LOG

VALIDATED KDR 2/19/92 SIGNATURE/DATE

Boring or Well No. 199-N-74

Sheet 1 of 5

Location 100-N-AREA / 1325 N FACILITY

Project RCRA WO17 / 100N

Elevation 454.14 Brass Cap

Drilling Contractor KEH

Driller Don Kruger

Drilling Method and Equipment CABLE TOOL / Bucyrus Erie

Prepared By Dennis Anderson (Sign/Print Name) Date 8/7/91

Reviewed By R.S. Miller (Sign/Print Name) Date 8/24/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
5.0'	1rad 1moist 2lith	BH		GRAVEL w/trace sand (20% sc, 25% vcp, 20% cp, 25% mp, 5% fp, 5% vfp, sand is med-vf, 2.5y 4/2 dk gry brn WET, 2.5y 6/2 lt brn gry Dry, sample is dry, mod.-poorly sorted, rnd-wellrnd / spherical-discoidal, very slight Rxn to 10% HCl, 85% basalt, 15% Qtz, Qtze porph vol, gran., Non-plastic slight Amt of magnetite to 1mm. ph on sample is 6 per W. Sealock	sample taken 7/8/91 @ 09:20
10.0'	1rad 1moist 2lith	BH		GRAVEL trace sand <1% (15% sc, 25% vcp, 25% cp, 20% mp, 10% fp, 5% vfp, 2.5y 4/2 dk gry brn WET, 2.5y 6/2 lt brn gry Dry, sample is dry, mod. sorting, rnd-wellrnd / discoidal-subprismoidal, No Rxn to 10% HCl, 90% basalt, 10% vol porph, Qtz, Qtze Non-plastic, magnetite is freq. ph reading is 6-6.5 per W. Sealock	10' sample taken 7/8/91 @ 10:00 15 gals H_2O ADDED 65 gals H_2O ADDED
15.0	1rad 1CaCO3 2lith	HT		GRAVEL w/trace sand (99% GRAVEL <1% sand) gravel range fine to medium due to hard tool, 3/1 2.5y vy dk gry WET 2.5y 4.5/1 gry-dk gry Dry, SAT sample, 95% basalt, 5% Qtz, Qtze, Non-plastic, No magnetic material	15% sample @ 1100 8/8/91 25 gal H_2O added from 10.0' to 15.0'
20.0'				A-41 Non-plastic, Non-magnetic ph reading is 6 per W. Sealock	35 gals H_2O ADDED (140)

9413224.0058

BOREHOLE LOG

Boring or Well No. 199-N-74

Sheet 2 of 5

Location 100N AREA / 1325 N Facility

Project RCRA W017 / 100N

Elevation 454.14' Brass Marker

Drilling Contractor KEH

Driller ~~Ron~~ DON Kruger

Drilling Method and Equipment CABLE TOOL -

Prepared By Dennis Anderson DENNIS ANDERSON (Sign/Print Name) Date 8/12/91

Reviewed By R. D. Miller (Sign/Print Name) Date 8/24/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
20.0'	1rad 1CaCO3 2 lith	HT		GRAVEL w/ trace sand, sample has been hand tooled w/ no visible roundness or sphericity. 5y 3/1 vy dk gry WET, 5y 4/1 dk gry DRY, sample is wet due to WATER ADD. No Rxn to 10% HCl. 90% basalt 10% Qtz, Qtze gran, vol porph. Non-plastic, No magnetic material	20' sample - 8/12/91 @ 0830
25.0				ph is 8.0 per W. Sealock	
	1rad 1CaCO3 2 lith	HT		sample is same in desc., color, HCl Rxn, and mineralogy	25' sample - 8/12/91 @ 1340
30.0				ph is 7.0 per W. Sealock	
	1rad 1CaCO3 2 lith	HT		GRAVEL w/ minor sand, sample now contains gravel subrnd - wellrnd / discoidal - spherical, mostly mp - fp w/ small amt. of vfp. rnd pebbles most ~15% remaining ang & crushed 5y 4/1 vdk gry WET, 5y 3/1 DRY, No Rxn to 10% HCl, 95% basalt, 5% Qtz, Qtze minor Qran.	30' sample - 8/12/91 @ 1415
35.0				ph is 7.0 per W. Sealock	
	1rad 1CaCO3 2 lith	HT		sample desc is same, 5y 3/1 vydk grey, 5y 4/1 dk grey DRY 20% pebbles are subrnd - wellrnd remaining ang + crushed. No Rxn. to 10% HCl No magnetic material	35' sample - 8/12/91 @ 1500 total gals H_2O used from 18.0' to 36' is 50 T= 190 gals
				ph is 7.0 per W. Sealock	

A-6000-382 (04/90)

9413224.0059

BOREHOLE LOG

Boring or Well No. 199 N-74

Sheet 3 of 5

Location 1325 N Facility / 100N Area

Project RCRA W017 / 100N

Elevation 454.14' Bins Cap

Drilling Contractor KEH

Driller Don Kruger

Drilling Method and Equipment CABLETOOL - BUCYRUS ERIE

Prepared By Dennis Anderson DENNIS ANDERSON (Sign/Print Name) Date 8/13/91

Reviewed By R D Miller (Sign/Print Name) Date 8/29/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
40.0'	1rad 1CaCO3 2 lith	HT		GRAVEL w/ trace sand - 90% ang due to hammer, 10% rnd-well rnd - med-vfp 5y 3.5/4 vydk gry WET, 5y 6.5/7 dk grey DRY, slight Rxn to 10% HCl Non plastic, No magnetic material, 95% basalt, 5% Qtz Qtze, gran, vol porph	40.0' sample - 8/13/91 @ 0945
				ph is 7.0 per D. Vance	
45.0'	1rad 1CaCO3 2 lith	HT		same desc as above	sample taken 8/14/91 @ 1130
					Contact between coarse basalt gravels and fine intermixed gravels is @ 49.8' b/s
50.0'				ph is 7.5 per D. Vance	
	1rad 1CaCO3 2 lith	HT		sandy GRAVEL (5% sand 95% GRAVEL) 35% vcs 20% cs, 15% ms, 15% fs, 15% vfs - 55% mp, 25% fp, 20% vfp 2.5y 5.5-6/2 lgt gry brn WET, 2.5y 6.5-7/2 lgt gry DRY, well-mod sorted, ang-subrnd / discoidal weak Rxn to 10% HCl, 85% basalt 10% Qtz 5% gran sulfides, pegmatite minerals misc, trace magnetic mat.	49.8' b/s 50.0 sample @ 8/15/91 @ 10:15
				phis 7.0 per D. Vance	
55.0'	1rad 1CaCO3 2 lith	HT		sandy GRAVEL (10% sand - 90% GRAVEL) same desc - 2.5y 5/2 gry brn WET, 2.5y 7/2 lgt gry DRY, well-mod sorted, ang-subrnd discoidal, weak Rxn to 10% HCl 80% basalt, 10% Qtz, 10% Qtze, gran, misc, Non-plastic, trace magnetic material	sample @ 8/15/91 @ 1500
				ph is 7.0 per D. Vance	

9413224.0060

6000-282 (04/90)

BOREHOLE LOG

Boring or Well No. 199-N-79

Sheet 4 of 5

Location 1325 N FACILITY / 100 N Area

Project RCRA W017 / 100N

Elevation 454.14' Brass Cap

Drilling Contractor KEH

Driller Don Kruger

Drilling Method and Equipment Bucyrus Erie - Cable Tool

Prepared By [illegible] (Sign/Print Name) Date 8/15/91

Reviewed By [illegible] (Sign/Print Name) Date 8/29/91

Depth (feet)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
60.0'	1rad 1CaCO3 2lith	HT		GRAVEL (w trace sand) 80% fp, 20% vfp 60% vcs, 30% cs, 10% m-vfs, sample is sat due to add of H2O, 2.5y 5/2 gr brn WET, 2.5y 7/2 lt gry, well sorted, sub ang - subrnd / discoidal, weak Rxn to 10% HCl, 80% basalt, 10% Qtz, 10% Qtze, gran, sedp, Non plastic very slight mag material,	sample taken 8/15/91 @ 1530 > sand from 60.0' - 62.0'
				ph is 7.0 per D. Vance	
65.0'	1rad 1CaCO3 2lith	HT		sandy GRAVEL (5% sand 95% GRAVEL) same as above 2.5y 4.5/2 dk gry brn WET, 2.5y 6.5/2 lt brn gry, well sorted, ang - subrnd, slight Rxn to 10% 85% basalt, 10% Qtz 5% Qtze, gran, porph vol., Non plastic, No mag mat.	65' sample. 8/16/91 @ 0900
				ph is 7.0 per D. Vance	
70.0'	1rad 1CaCO3 2lith	HT		sandy GRAVEL (5% sand 95% GRAVEL) desc is same as 65.0' sample 5y 4.5/2 lt olive gry WET, 5y 6/2 olive gry DRY, well sorted, ang - subrnd weak Rxn to 10% HCl, 80% basalt 10% Qtz, 10% Qtze, gran, Chert, porph vol, Non plastic; slight mag material	sample @ 8/16/91 @ 1920
				ph is 7.0 per D. Vance	
75.0'	1 RAD 1 CaCO3 2 Lith	HT		SANDY GRAVEL (5% SAND, 95% GRAVEL) DESC. SAME AS 65' SAMPLE. 5Y 4/2 LT OLIVE GRAY (WET), 5Y 6/2 OLIVE GRAY (DRY). WELL SORTED, ANG - SUBRND, WEAK RXN TO 10% HCL 80% BASALT, 10% QTZ, 10% GRAN, CHERT, PORPHYVOL	SAMPLE @ 081991 @ 1015
77.0'	1 RAD 1 CaCO3 2 Lith	SPLIT TUBE		77.0' SANDY GRAVEL (40% SAND 60% GRAVEL) 10% VCS, 10% CS, 10% MS, 30% FS, 10% VFS - 10% SR 10% ICP, 10% CP, 45% MP, 15% FP, 10% VFP, 2.5Y 5/2 GRAYISH BROWN (DRY), 2.5Y 4/2 DK GRAYISH BRN (WET) SAMPLE MOIST/WET, MODERATELY SORTED, SUBROUNDED	SAMPLE @ 081991 @ 1125 SPLIT-TUBE SAMPLE

A-6000-382 (04/90)

9413224.0061

BOREHOLE LOG

Boring or Well No. 199-N-74

Sheet 5 of 5

Location 1325 N FACILITY /100-N AREA

Project RCRA W017/100-N

Elevation 454.14' Brass Cap

Drilling Contractor KEH

Driller DON KRUGER

Drilling Method and Equipment BUCYRUS ERIE CABLE TOOL

Prepared By WILLIAM E. BRENNAN (Sign/Print Name) Date 082091

Reviewed By R. D. Miller (Sign/Print Name) Date 8/27/91

Depth (FEET)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
80.0	1 RAD 1 CaCO3 2 LTH	HT		77.0' DESCRIP (COND SPHERICAL TO SUBROUNDAL, 60% BASALT, 25% QTZ, 15% QTZE, SOLUBLE MATERIAL. WEAK RXN TO 10% HCL	
				80.0 SAME DESCRIPTION AS 77' SAMPLE NO RXN TO 10% HCL	SAMPLE @ 082191 @ 1025
82.0	1 RAD 1 CaCO3 2 LTH	SPLIT TUBE 82-84'		82.0-83.0 SAND (100% SAND) 5% MS, 45% FS, 50% VFS. 2.5Y 6/3 LIGHT YELLOWISH BROWN (DRY), 2.5Y 4/2 DARK GRAYISH BROWN (WET) SAMPLE WET. VERY WELL SORTED, SUBROUNDED TO ROUNDED, SPHERICAL TO SUBPRISMOIDAL. 70% QTZ, 25% BASALT, 5% OTHER. STRONG RXN TO 10% HCL	SAMPLE @ 082191 @ 1310
84.0				83.0-83.3 GRAVELLY-SAND (30% GRAVEL, 70% SAND) 50% FP, 50% VFP - 30% VCS, 30% CS, 20% MS, 10% FS, 10% VFS. 5Y 6/1 GRAY (DRY) 5Y 3/1 VERY DARK GRAY (WET). 70% BASALT, 30% QTZ/QTZE. WEAK RXN TO 10% HCL	
				83.3-84.0 SANDY GRAVEL (35% SAND, 5% SILT 60% GRAVEL) 15% VCS, 15% CS, 25% MS, 25% FS, 15% VFS 5% SILT - 15% VCP, 15% CP, 35% MP, 20% FP, 15% VFP 2.5Y 6/2 LIGHT YELLOWISH BROWN (DRY), 2.5Y 4/2 DARK GRAYISH BROWN (WET). SAMPLE WET, MODERATELY SORTED, SUBANGULAR TO SUBROUNDED, SUBPRISMOIDAL TO SUBPRISMOIDAL. 70% BASALT, 15% QTZ/QTZE/CHERT, 15% GRAN/RHYOLITE/BRIT. WEAK RXN TO 10% HCL	TOTAL DEPTH OF HOLE = 84.0'

9413224.0062

100-N FACILITY

WELL 199-N-74

DRILLING

START DATE	FINISH DATE	TOTAL DAYS	CURRENT DEPTH	FINAL DEPTH	DEPTH TO WATER	WATER ADDED(GAL)
8-7-91	8-29-91	13	N/A	84.0	8-19-91 69.4 PM 64.8 8-20-91 64.3' 8-21-91 66.5' 8-22-91 63.4'	410 GALLONS

DOWN HOLE COMPLETION

START DATE	FINISH DATE	TOTAL DAYS	DEPTH TO WATER	DEPTH TO BOTTOM	DEPTH OF SCREEN	WATER ADDED/ REMOVED (GAL)
10-22-91	10-29-91	5	10-23-91 62.2', 10-29-91 62.3'	84.2'	58.9'-79.3' *	30 GALLONS REMOVED TO DEVELOP FILTER PACK.

* 79.6' w/ENDCAP

DEVELOPMENT AND ASSOCIATED ACTIVITIES

TV CAMERA DATE	AQUIFER TEST DATE	DEVELOPMENT DATE	HYDROSTAR PLACEMENT DATE	WATER REMOVED(GAL)
N/A	11-4-91	11-4-91	11-4-91	810 GALLONS

COMMENTS:

VALIDATED
KDR 2/19/92
SIGNATURE/DATE

WELL CHECK LIST

Well Number: 199-N-74 Location: 100N(91)

Date: 1/24/92

	Yes	No
Hasp on protective casing	✓	
Lock	✓	
Proper cap fit	✓	
Well ID number on brass cap	✓	
Protective post painted	✓	
Well ID number stenciled on post	✓	
Well ID number stenciled on protective casing	✓	
Survey mark on casing	✓	
Stock tank		✓
Site neat	✓	

Comments:

Signature: Edward C. Rafuse Date: 1/24/92

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9413224.0065

GEOPHYSICAL LOGS

9413224.0066

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9413224.0067

Westinghouse Hanford Company	LOG HEADER	Page 1 of 2

Well No. 199-N-71 Area 100 N Date 8/29/91

Log Run #1 Log Type Gross Gamma

Elevation Datum _____ Elevation _____

Survey Coordinates _____ N _____ E

Log Measured From Ground Surface

Location Description South of 100N Area

Ground Surface Elevation _____

Surface Temperature 19.4°C Weather Partly Cloudy - Warm

BOREHOLE INFORMATION

Driller Joe Ockert

Drill Rig Type Cable Tool	Bit Type/Diameter Drive Barrel / 10"
Borehole Diameter(s)/Depth 12" / 12.6'	10" / 87.0'
Depth Driller 87.0'	Depth Logger 85.3'
Liquid Level 68.02'	Liquid ~~Density~~ Appearance Slightly Turbid
Temperature 19.2°C	

CASING RECORD

Type 12" Carbon Steel Sch. 40	Interval 0.0' - 12.61'
Type 10" Carbon Steel Sch. 40	Interval 1.1' - 86.52'
Type	Interval
Type	Interval

Well Screen Interval NA

Comments: Return Error = +0.1' high
Centralizer used.

9413224.0068

N-71

LOG HEADER

EQUIPMENT DATA

Logging Company: PNL

Operator(s): Alan Pearson

Equipment Brand: MLS — Equipment Type: Analog

Tool Type: Gamma Ray — Serial No.: C627A97

Base Calibration Date: 5/91 — Calibration Reference:

Calibration/Probe Factor: 8.84x10^-3 eU p/m/c/s — Base Calibration Datum (eU): Position 1: 297.4 eU — Position 2: 64.3 eU

Dead Time: 11.8 μsec — Warm Up Time: >15 min

LOGGING INFORMATION

Log Interval From: 85.3' — To: 4.0'

Rerun(s): 85.3' to 50.0'

Pre Survey Verification: Position 1: 300.6 eU — Position 2: 64.5 eU — Background: 75 c/s

Base Calibration Difference: Position 1: 3.2 eU — Position 2: 0.2 eU

Logging Speed: 5 ft./min. — Rerun Scales, CPS/in.: 50 c/s/in

Start Time: 0915 — Completion Time: 1100

Chart Speed(s), ft/in.: 10 ft./in.

Chart Recorder Horizontal Scale, CPS/in.: 50 c/s/in. — Time Constant(s): TC-1

Post Survey Verification: Position 1: 296.1 eU — Position 2: 63.6 eU — Background: 75 c/s

Percent Change: Position 1: 1.5% — Position 2: 1.4%

Comments: Return Error = +0.1' high

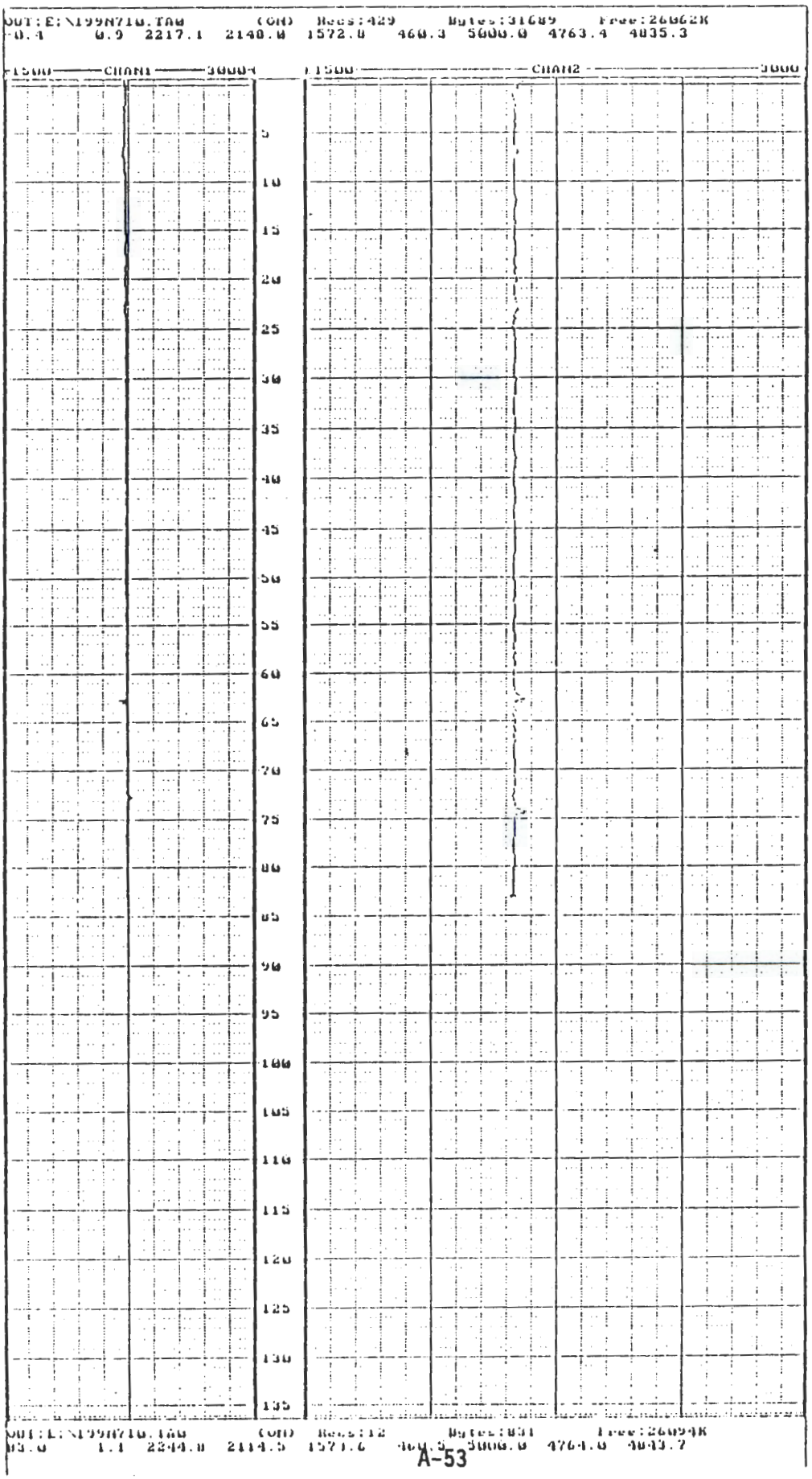
Centralizer used

Witnessed and Verified by: (sign and print name) Alan Pearson Alan Pearson — Date: 8/29/91

Magnetic 83.0'-0.0' 10/28/91 Run #1

Procedure # PNL-MA-567 GL-11 Rev. Ø

N-71

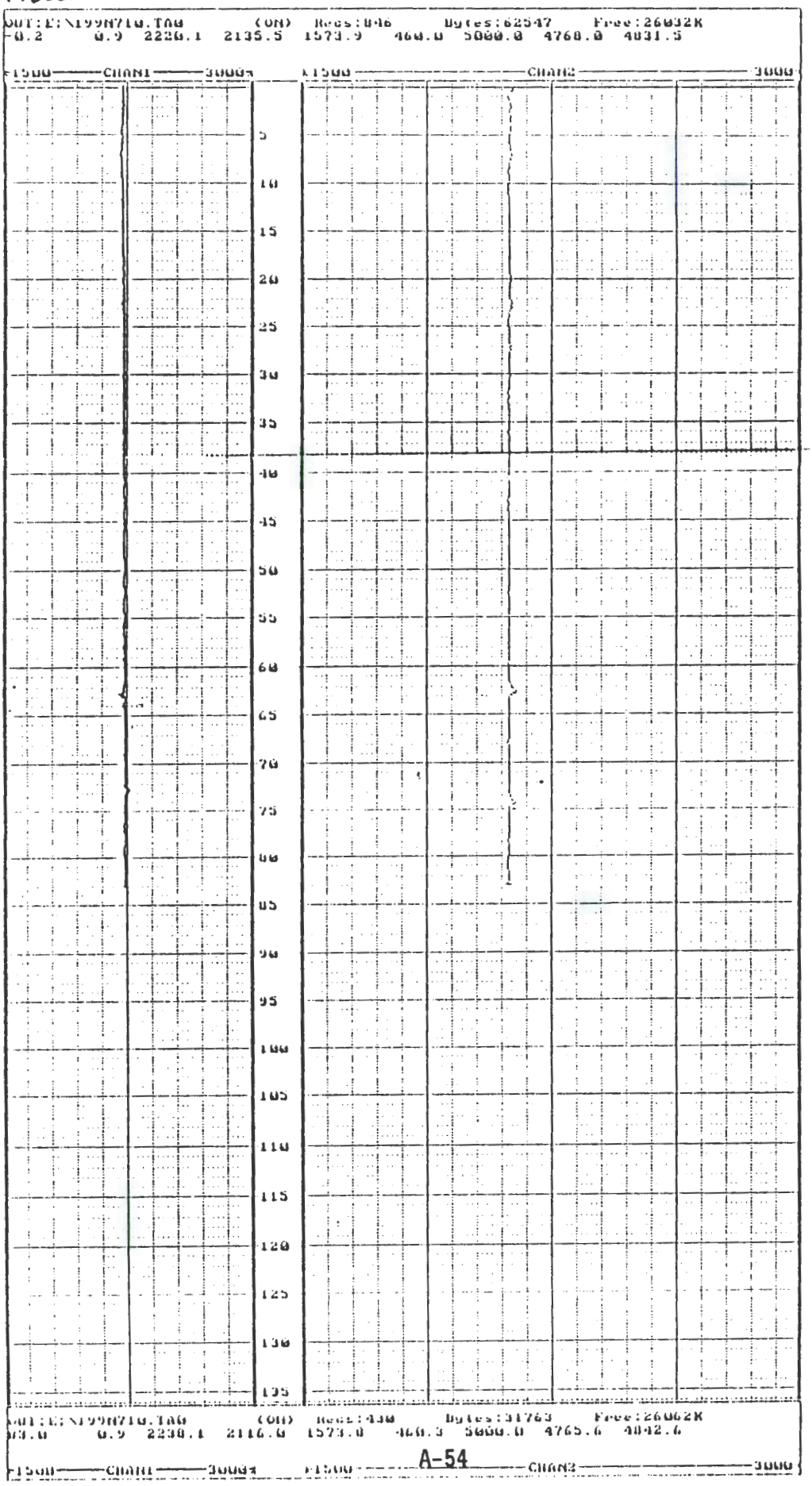


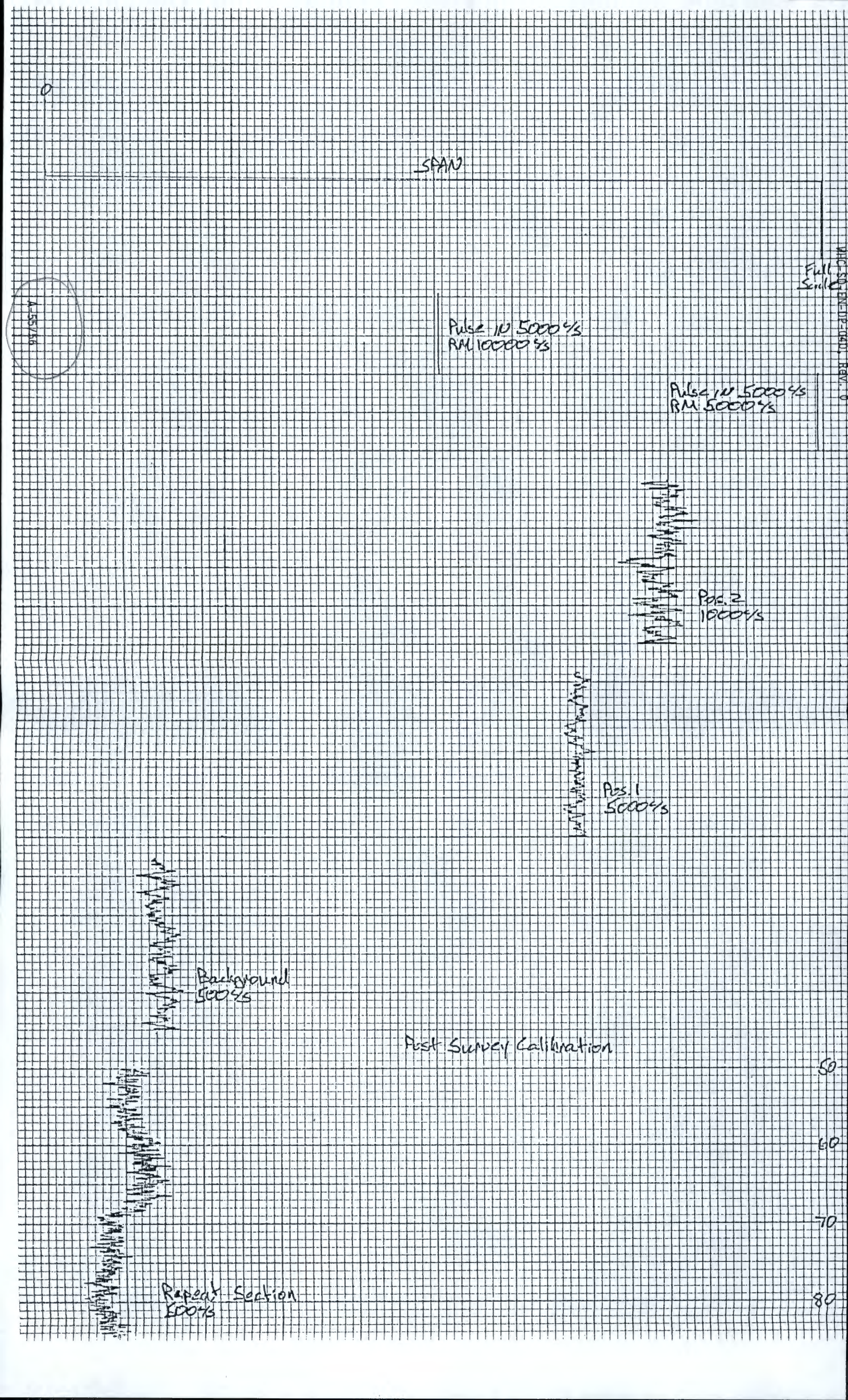
Magnetic 83.0'-0.0' 10/28/91 Run #2

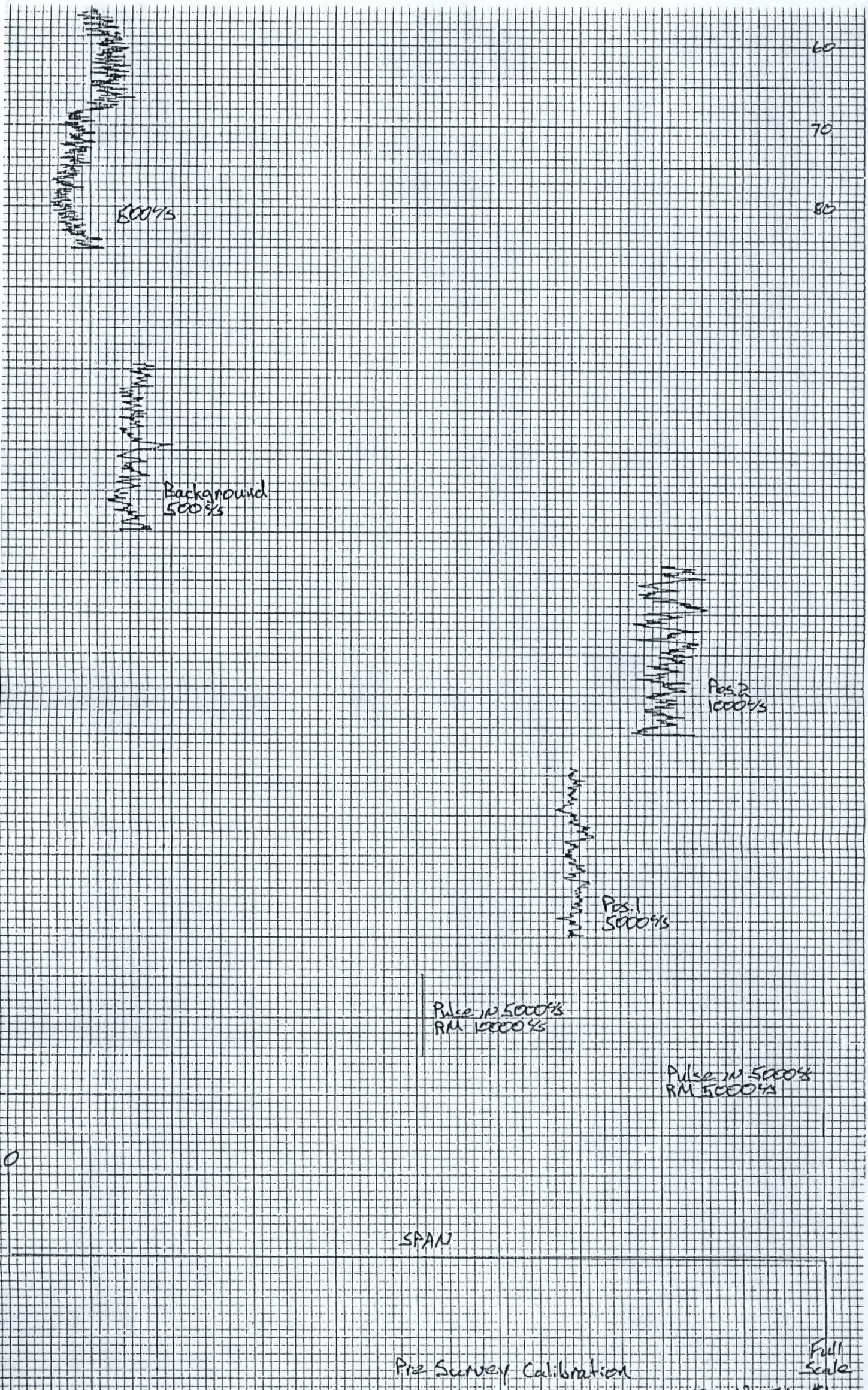
WHC-SD-EN-DP-040, Rev. 0

Procedure #PNL-MA-567 GL-11 Rev. Ø

N-71




0
SPAN
Full Scale
Pulse IN 5000 c/s
RM 10000 c/s
Pulse IN 5000 c/s
RM 5000 c/s
Pos. 2
10000 c/s
Pos. 1
5000 c/s
Background
500 c/s
Post Survey Calibration
50
60
70
80
Repeat Section
500 c/s
A-55/56
DOC-SO-DNE-D2-0601, REV. 0


60
70
80
500%
Background
500%
Pos.2
1000%
Pos.1
5000%
Pulse IN 5000%
RM 10000%
Pulse IN 5000%
RM 5000%
0
SPAN
Pre Survey Calibration
Full Scale
1991-12-71 #1

0

SPAN

Pulse 10 5000 v/s
RM 10000 v/s

Pulse 10 5000 v/s
RM 5000 v/s

Pos. 2
1000 v/s

Pos. 1
5000 v/s

Background
500 v/s

Post Survey Calibration

50

60

70

80

Repeat Section
500 v/s

10

20

30

40

50

60

70

80

500 v/s

Background
500 v/s

Pos. 2
1000 v/s

Pos. 1
5000 v/s

Pulse 10 5000 v/s
RM 10000 v/s

Pulse 10 5000 v/s
RM 5000 v/s

0

SPAN

Pre Survey Calibration

99-10-71

Westinghouse Hanford Company	LOG HEADER	Page 1 of 2

Well No. 199-N-72 Area 100N Date 9/16/91

Log Run #1 Log Type Gross Gamma

Elevation Datum _____ Elevation _____

Survey Coordinates _____ N _____ E

Log Measured From Ground Surface

Location Description 100N Area / 1325-N Facility

Ground Surface Elevation _____

Surface Temperature 24.0°C Weather Clear-Warm

BOREHOLE INFORMATION

Driller Joe Ockert

Drill Rig Type Cable Tool	Bit Type/Diameter Hard Tool / 10"
Borehole Diameter(s)/Depth 12"/10.1' 10"/84.0'	
Depth Driller 84.1'	Depth Logger 82.9'
Liquid Level 71.7'	Liquid Density Clean
Temperature 19.6°C	

CASING RECORD

Type 12" Carbon Steel Sch.40	Interval +0.5' - 10.09'
Type 10" Carbon Steel Sch.40	Interval +2.2' - 85.01'
Type	Interval
Type	Interval

Well Screen Interval NA

Comments: Return Error = +0.25' high
Centralizer used.
Approximately 2'-3' of mud on bottom of borehole.

A-6000-520 (05/90)

9413224.0072

N-72

LOG HEADER

EQUIPMENT DATA

Logging Company: PNL

Operator(s): Alan Pearson

Equipment Brand: MLS | Equipment Type: Analog

Tool Type: Gamma Ray | Serial No.: C627A97

Base Calibration Date: 5/91 | Calibration Reference: PNL-7785 UC-606

Calibration/Probe Factor: 8.84×10^{-3} eU P/m/c/s | Base Calibration Datum (eU): Position 1: 297.4 eU | Position 2: 64.3 eU

Dead Time: 11.8 μsec | Warm Up Time: >15 min

LOGGING INFORMATION

Log Interval From: 82.9' | To: 2.9'

Rerun(s): 82.8' to 50.0'

Pre Survey Verification: Position 1: 302.3 eU | Position 2: 63.6 eU | Background: 80 c/s

Base Calibration Difference: Position 1: 4.9 eU | Position 2: 0.7 eU

Logging Speed: 5 ft./min. | Rerun Scales, CPS/in.: 50 c/s/in

Start Time: 1020 | Completion Time: 1200

Chart Speed(s), ft/in.: 10 ft./in.

Chart Recorder Horizontal Scale, CPS/in.: 50 c/s/in. | Time Constant(s): TC-1

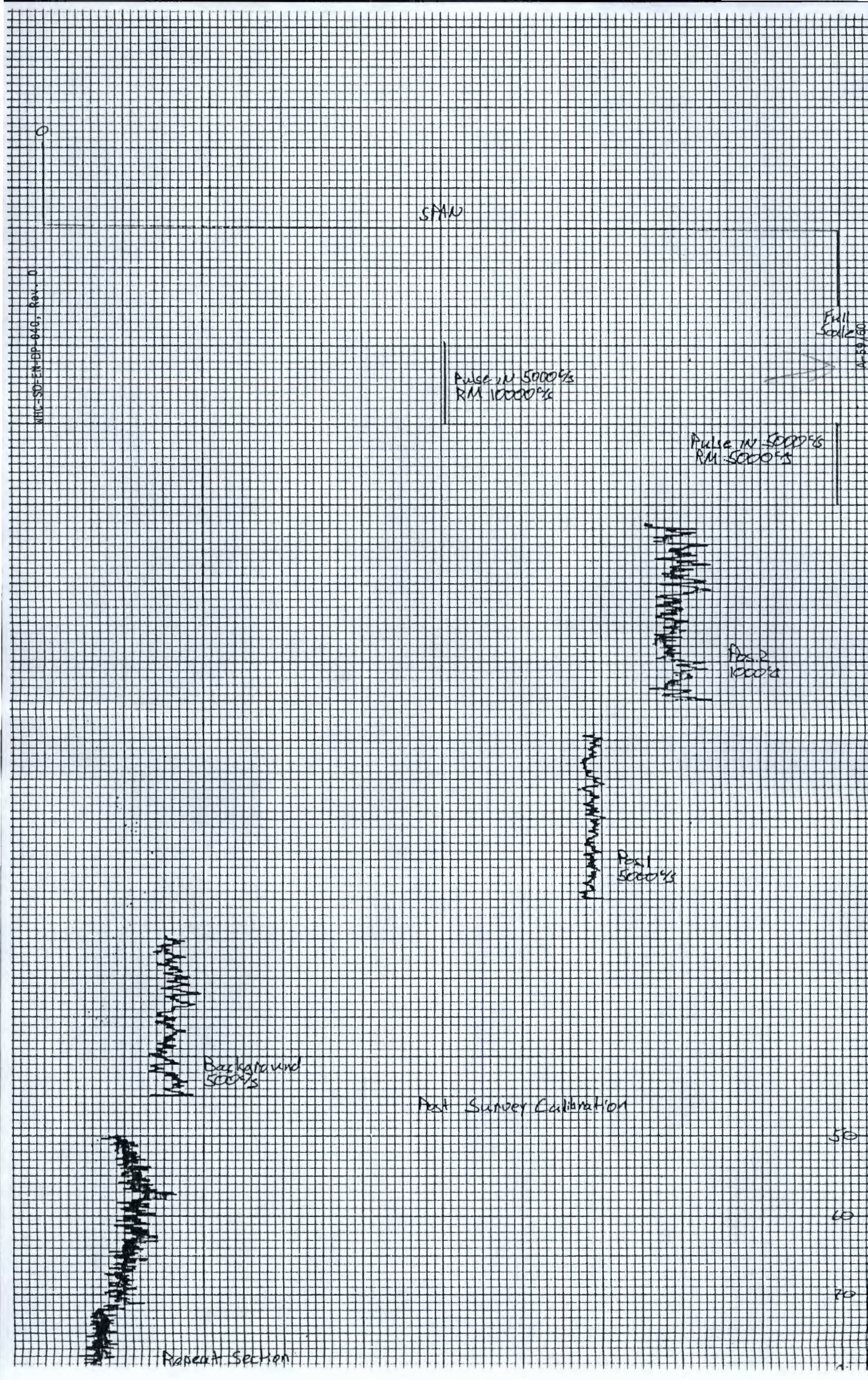
Post Survey Verification: Position 1: 297.9 eU | Position 2: 63.2 eU | Background: 80 c/s

Percent Change: Position 1: 1.5% | Position 2: 0.6%

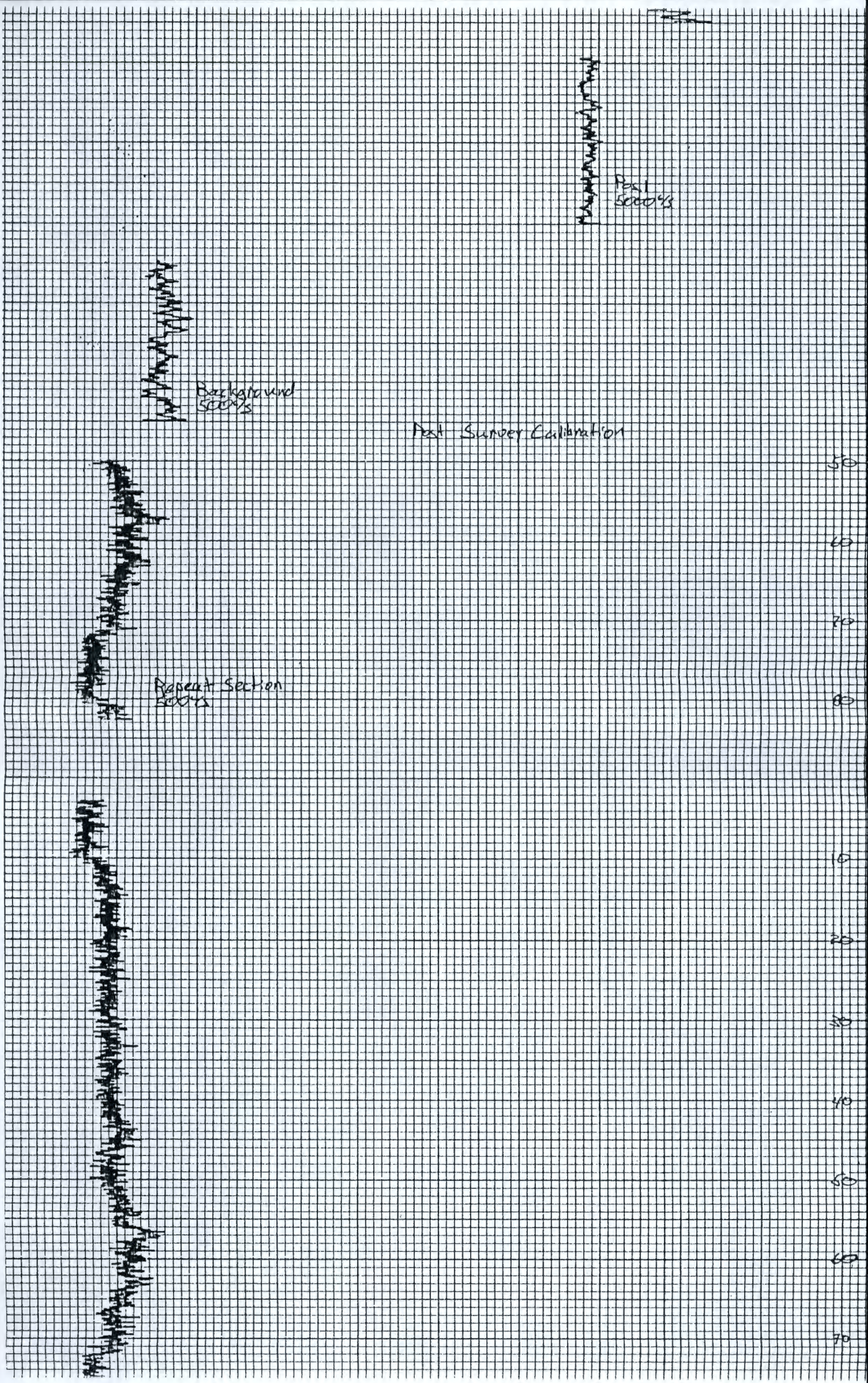
Comments: Return Error = +0.25' high

Centralizer used

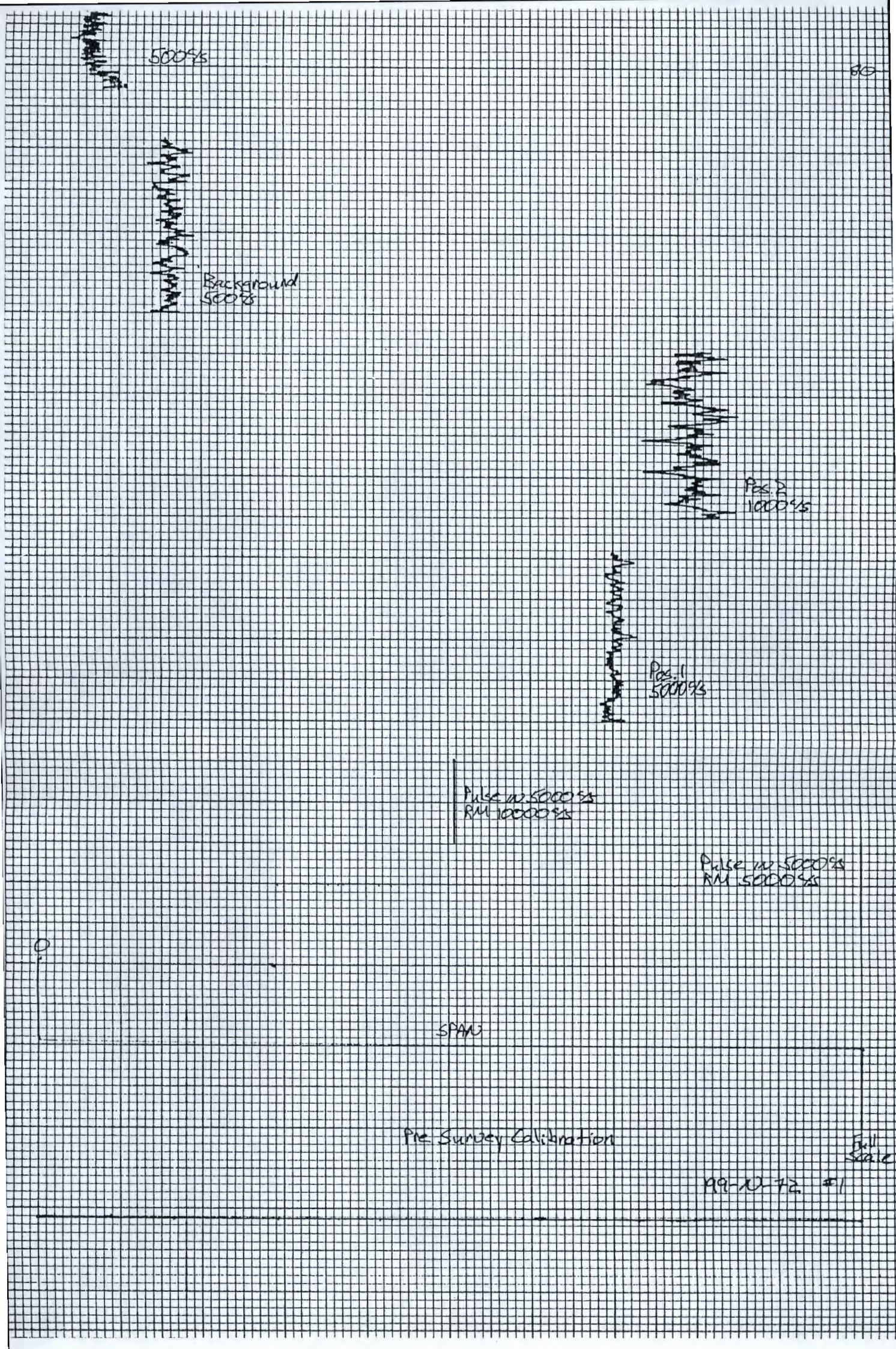
Witnessed and Verified by: (sign and print name) Alan Pearson Alan Pearson | Date: 9/16/91

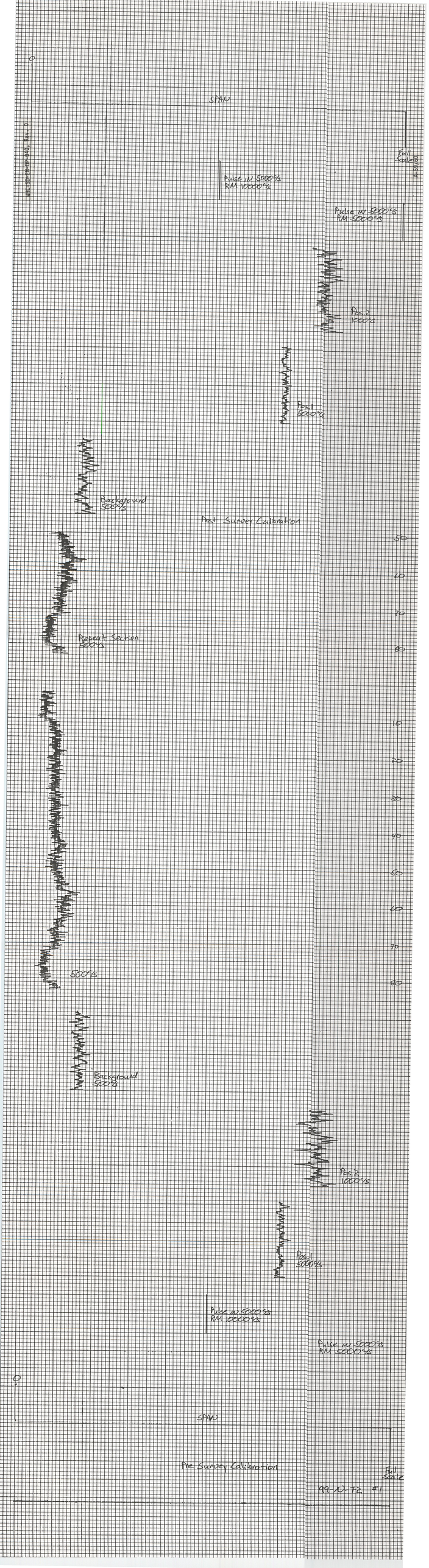


WHC-SD-EN-DP-040, Rev. 0


Pos1
5000c/s
Background
5000c/s
Post Survey Calibration
Repeat Section
5000c/s
50
60
70
80
10
20
30
40
50
60
70

10
20
30
40
50
60
70
80
500%s
Background
500%s
Pos. 2
1000%s
Pos. 1
500%s


500 c/s
Background
500 c/s
Pos. 2
1000 c/s
Pos. 1
5000 c/s
Pulse in 5000 c/s
RM 10000 c/s
Pulse in 5000 c/s
RM 5000 c/s
0
SPAN
Pre Survey Calibration
Full Scale
19-10-72 #1


0
SPAN
Pulse in 5000%
RM 10000%
Full Scale
Pulse in 5000%
RM 5000%
Pos 2
1000%
Pos 1
5000%
Background
5000%
Post Survey Calibration
50
60
70
80
10
20
30
40
50
60
70
80
Repeat Section
500%
5000%
Background
5000%
Pos 2
1000%
Pos 1
5000%
Pulse in 5000%
RM 10000%
Pulse in 5000%
RM 5000%
0
SPAN
Pre Survey Calibration
Full Scale
99-10-12 #1

Westinghouse Hanford Company	LOG HEADER	Page 1 of 2

Well No. 199-N-73 Area 100 N Date 9/16/91

Log Run #1 Log Type Gross Gamma

Elevation Datum _____ Elevation _____

Survey Coordinates _____ N _____ E

Log Measured From Ground Surface

Location Description 100 N Area 1324N

Ground Surface Elevation _____

Surface Temperature 21.0°C Weather Clear - Warm

BOREHOLE INFORMATION

Driller Don Kruger

Drill Rig Type Cable Tool	Bit Type/Diameter Hard Tool /10"
Borehole Diameter(s)/Depth 12"/ 19.9'	10"/89.0'
Depth Driller 89.0'	Depth Logger 86.7'
Liquid Level 68.6'	Liquid ~~Density~~ Clean
Temperature 19.4 °C	

CASING RECORD

Type 12" Carbon Steel Sch.40	Interval +0.7' - 19.92'
Type 10" Carbon Steel Sch.40	Interval +2.2' - 86.99'
Type	Interval
Type	Interval

Well Screen Interval N/A

Comments: Return Error = +0.17' high
Centralizer used.

9413274.0074

N-73

LOG HEADER

EQUIPMENT DATA

Logging Company: PNL

Operator(s): Alan Pearson

Equipment Brand: MLS — Equipment Type: Analog

Tool Type: Gamma Ray — Serial No. C627A97

Base Calibration Date: 5/91 — Calibration Reference: PNL-7785 UC-606

Calibration/Probe Factor: 8.84x10^-3 eU P/MCPS — Base Calibration Datum (eU): Position 1: 297.4 eU — Position 2: 64.3 eU

Dead Time: 11.8 μsec — Warm Up Time: >15 min

LOGGING INFORMATION

Log Interval From: 86.7' — To: 2.9

Rerun(s): 86.7' to 55.0'

Pre Survey Verification: Position 1: 303.2 eU — Position 2: 65.4 eU — Background: 70 c/s

Base Calibration Difference: Position 1: 5.8 eU — Position 2: 1.1 eU

Logging Speed: 5 ft./min. — Rerun Scales, CPS/in.: 50 c/s/in

Start Time: 0745 — Completion Time: 0945

Chart Speed(s), ft/in.: 10 ft./in.

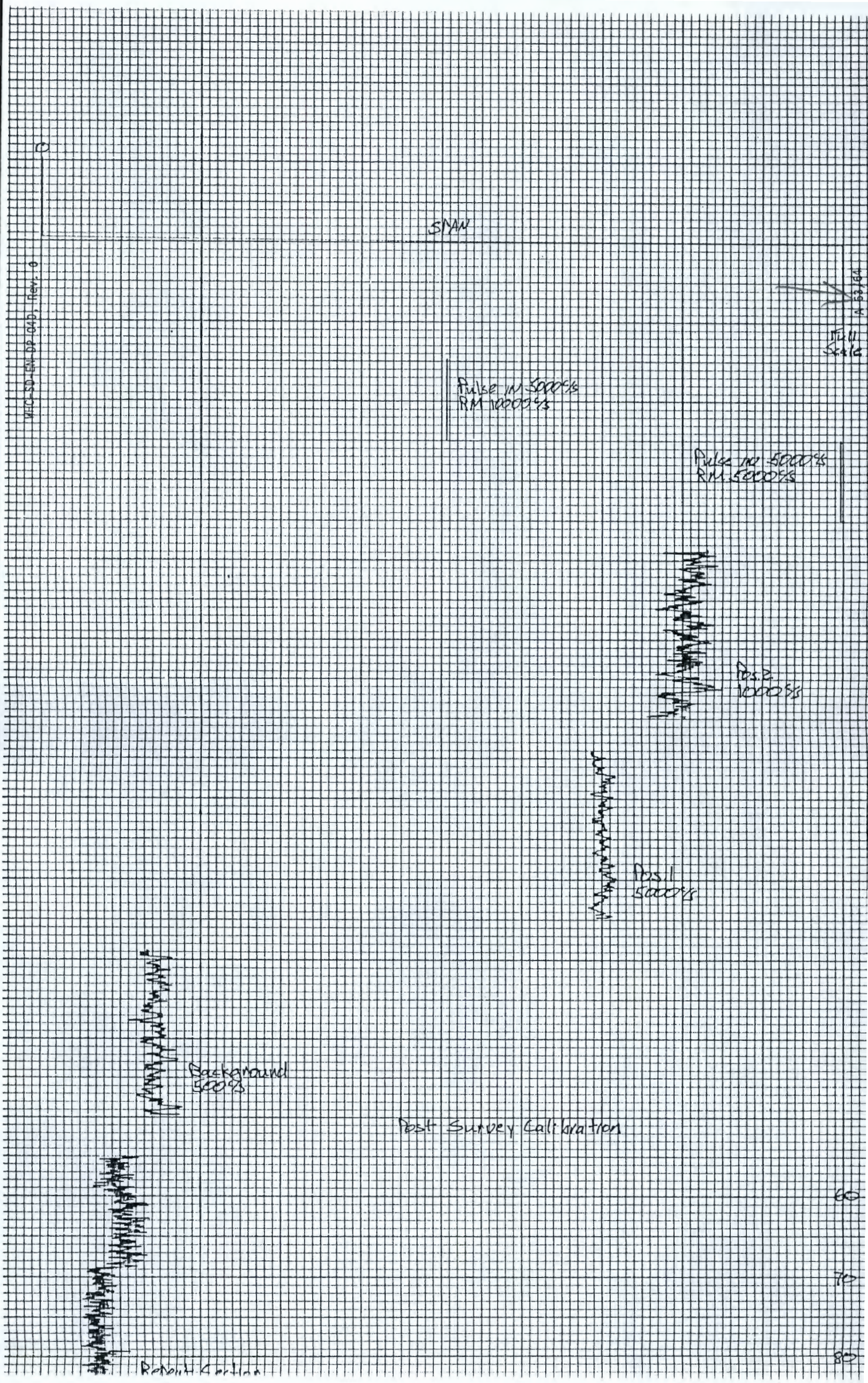
Chart Recorder Horizontal Scale, CPS/in.: 50 c/s/in. — Time Constant(s): TC-1

Post Survey Verification: Position 1: 303.2 eU — Position 2: 65.0 eU — Background: 70 c/s

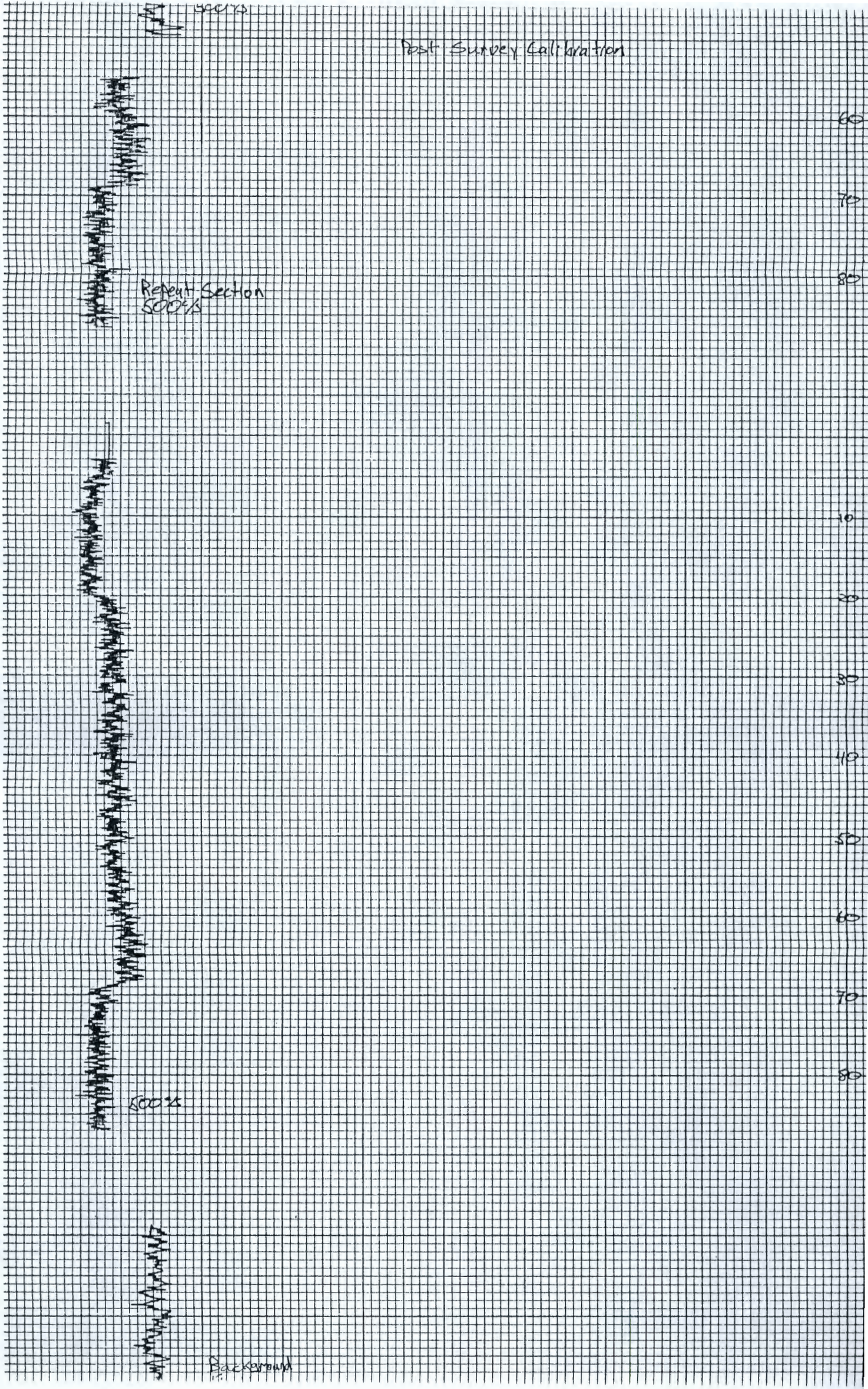
Percent Change: Position 1: 0.0% — Position 2: 0.6%

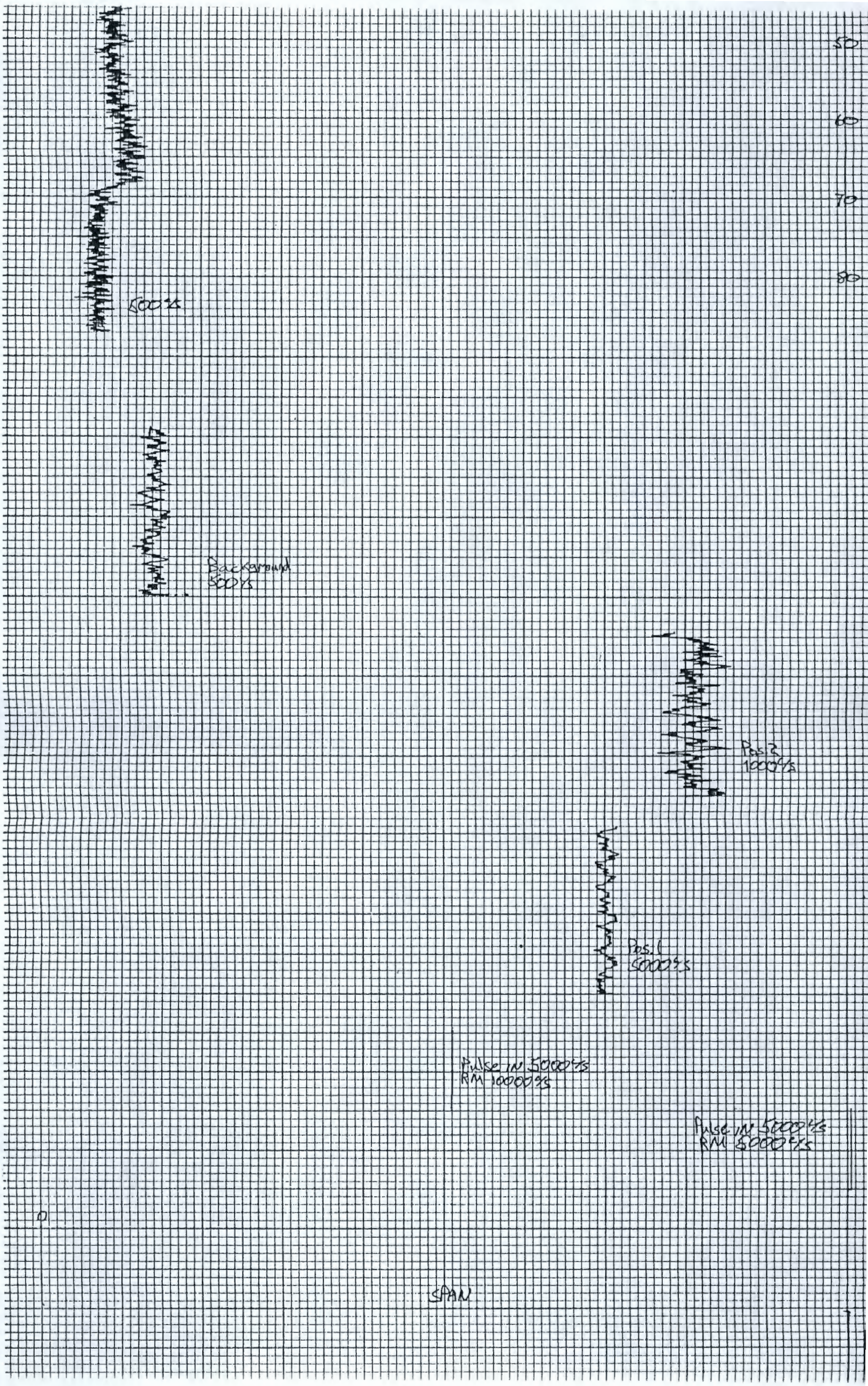
Comments: Return Error = +0.17' high
Centralizer used.

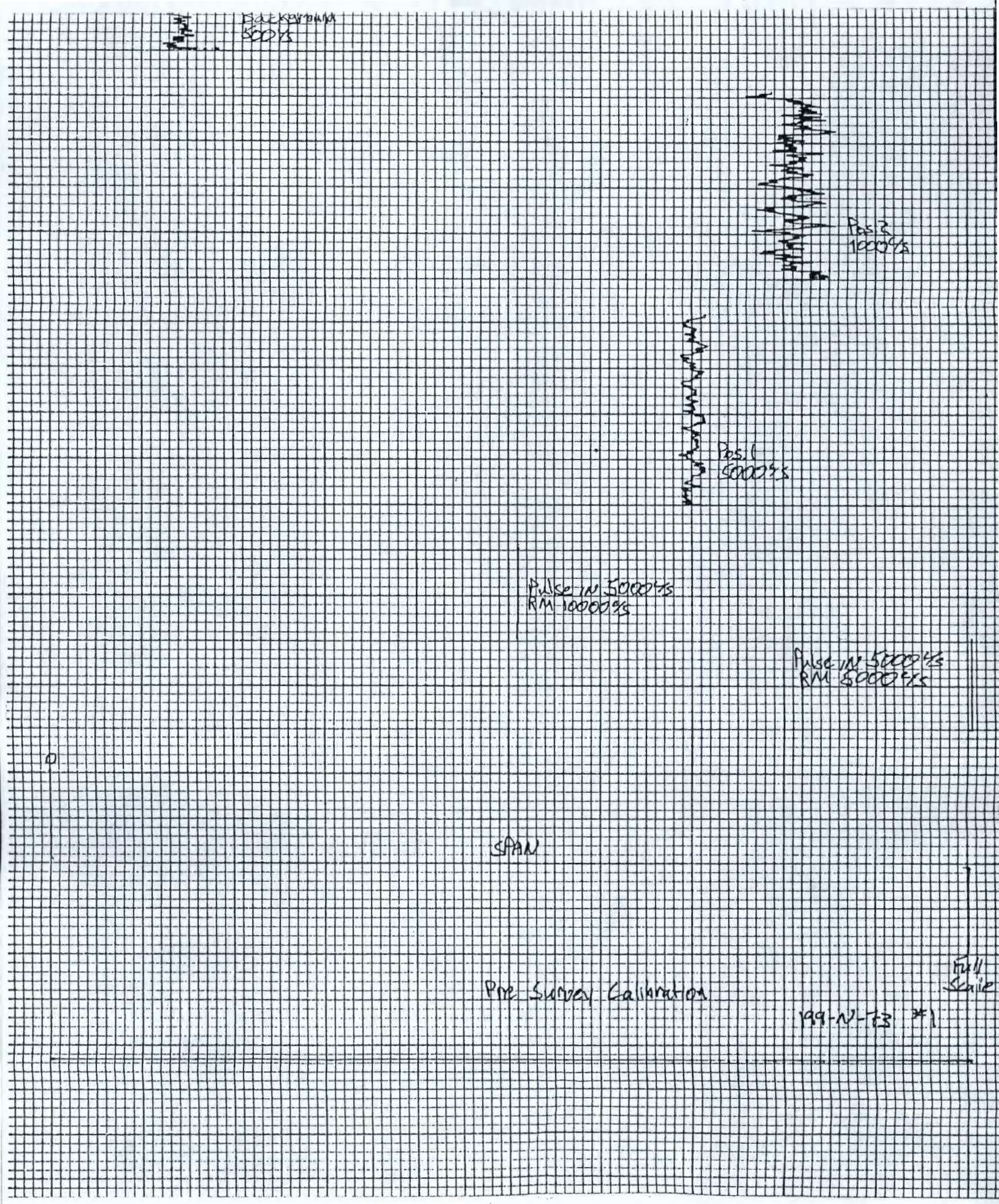
Witnessed and Verified by: (sign and print name) [illegible]

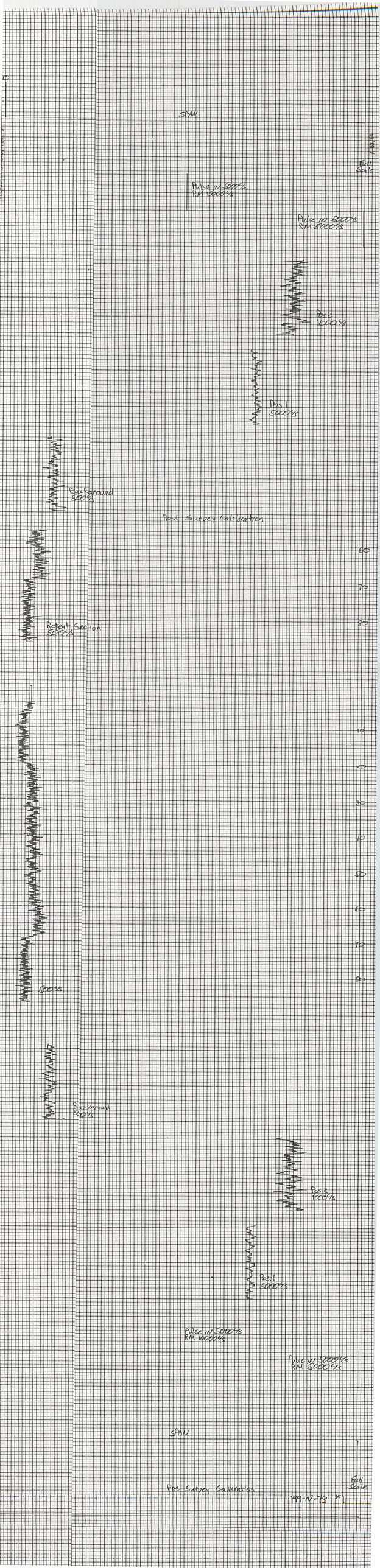


WIC-SD-EM-DP-040, Rev. 0


Post Survey Calibration
60
70
80
Repeat Section
500°/s
10
20
30
40
50
60
70
80
500°/s
Background


50
60
70
80
500 µs
Background
500 µs
Pos. 3
1000 µs
Pos. 1
5000 µs
Pulse IN 5000 µs
RM 10000 µs
Pulse IN 5000 µs
RM 5000 µs
0
SPAN


Background
500 ppm
Pos 3
10000 ppm
Pos 1
5000 ppm
Pulse IN 5000 ppm
RM 10000 ppm
Pulse IN 5000 ppm
RM 5000 ppm
0
SPAN
Full Scale
Pre Survey Calibration
199-N-63 #1


SPAN
Full Scale
Pulse IN 5000%
RM 1000%
Pulse IN 5000%
RM 5000%
Pos 2
1000%
Pos 1
5000%
Background
500%
Post Survey Calibration
60
70
80
Recent Section
500%
10
20
30
40
50
60
70
80
500%
Background
500%
Pos 2
1000%
Pos 1
5000%
Pulse IN 5000%
RM 1000%
Pulse IN 5000%
RM 5000%
SPAN
Full Scale
Pre Survey Calibration
99-N-73 #1

Westinghouse Hanford Company	LOG HEADER	Page 1 of 2

Well No. 199-N-74 Area 100N Date 8/29/91

Log Run #1 Log Type Gross Gamma

Elevation Datum _____ Elevation _____

Survey Coordinates _____ N _____ E

Log Measured From Ground Surface

Location Description S of 100 N Area

Ground Surface Elevation _____

Surface Temperature 29.9°C Weather Clear - Hot

BOREHOLE INFORMATION

Driller P. Kruger

Drill Rig Type Cable Tool | Bit Type/Diameter Hard Tool / 10"

Borehole Diameter(s)/Depth 12"/~~84.0~~ AWF 8/29/91 10.2' 10"/84.0'

Depth Driller 84.0' | Depth Logger 83.4'

Liquid Level 63.4' | Liquid ~~Density~~ Appearance Clear

Temperature 19.3°C

CASING RECORD

Type 12" Carbon Steel Sch.40 | Interval +0.3' - 10.15'

Type 10" Carbon Steel Sch.40 | Interval +2.6' - 84.29'

Type | Interval

Type | Interval

Well Screen Interval NA

Comments: Return Error = +0.2' high
Centralizer used.

A-6000-520 (05/90)

9413224.0076

LOG HEADER

EQUIPMENT DATA

Logging Company: PNL

Operator(s): Alan Pearson

Equipment Brand: MLS — Equipment Type: Analog

Tool Type: Gamma Ray — Serial No.: C627A97

Base Calibration Date: 5/91 — Calibration Reference:

Calibration/Probe Factor: 8.84x10^-3 eU p/m/c/s — Base Calibration Datum (eU): Position 1: 297.4 eU — Position 2: 64.3 eU

Dead Time: 11.8 μ sec — Warm Up Time: >15 min

LOGGING INFORMATION

Log Interval From: 83.4' — To: 2.5'

Rerun(s): 83.4' to 40.0'

Pre Survey Verification: Position 1: 294.4 eU — Position 2: 63.2 eU — Background: 170 c/s

Base Calibration Difference: Position 1: 3.0 eU — Position 2: 1.1 eU

Logging Speed: 5 ft./min. — Rerun Scales, CPS/in.: 50 c/s/in

Start Time: 1200 — Completion Time: 1330

Chart Speed(s), ft/in.: 10 ft./in.

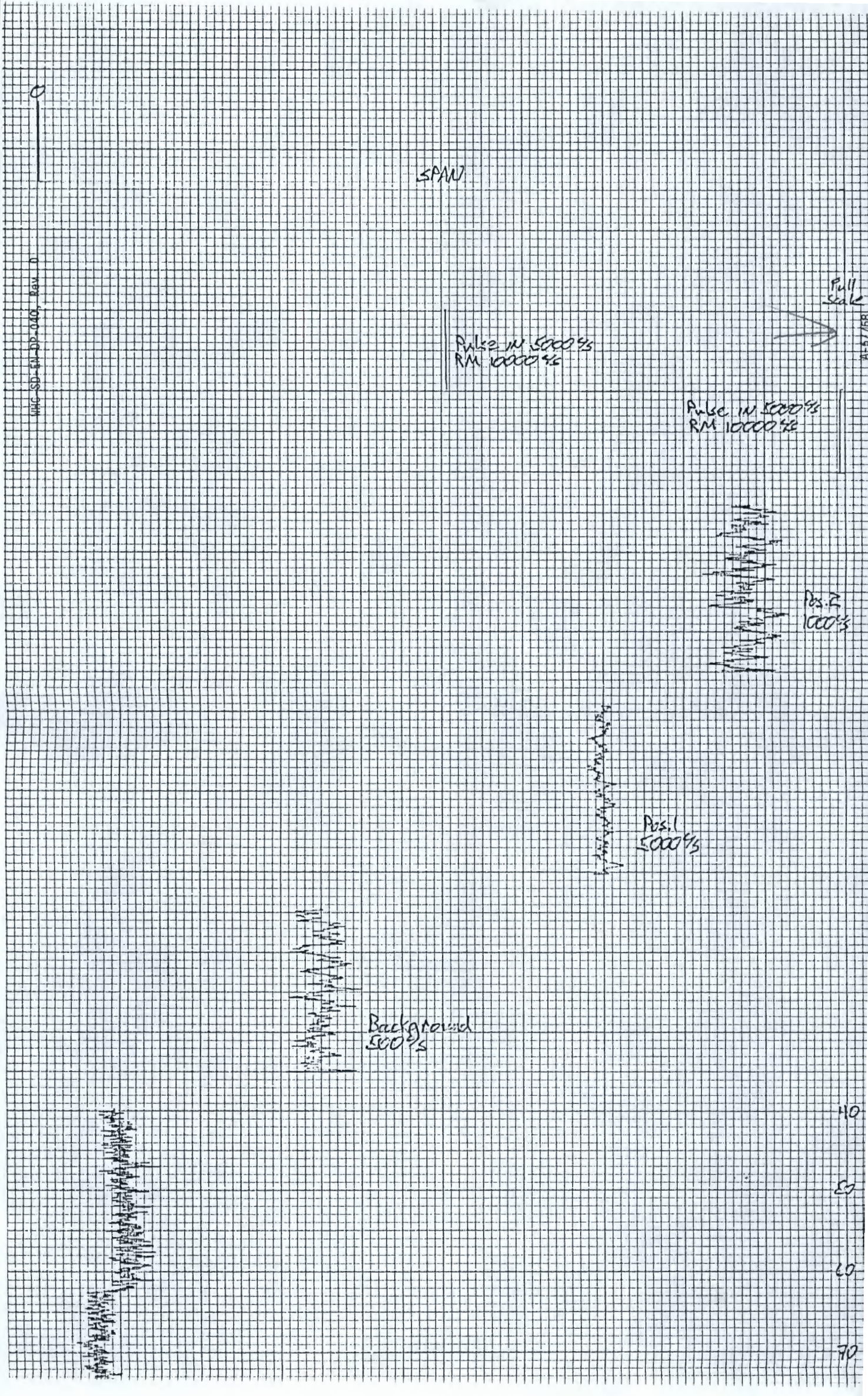
Chart Recorder Horizontal Scale, CPS/in.: 50 c/s/in. — Time Constant(s): TC-1

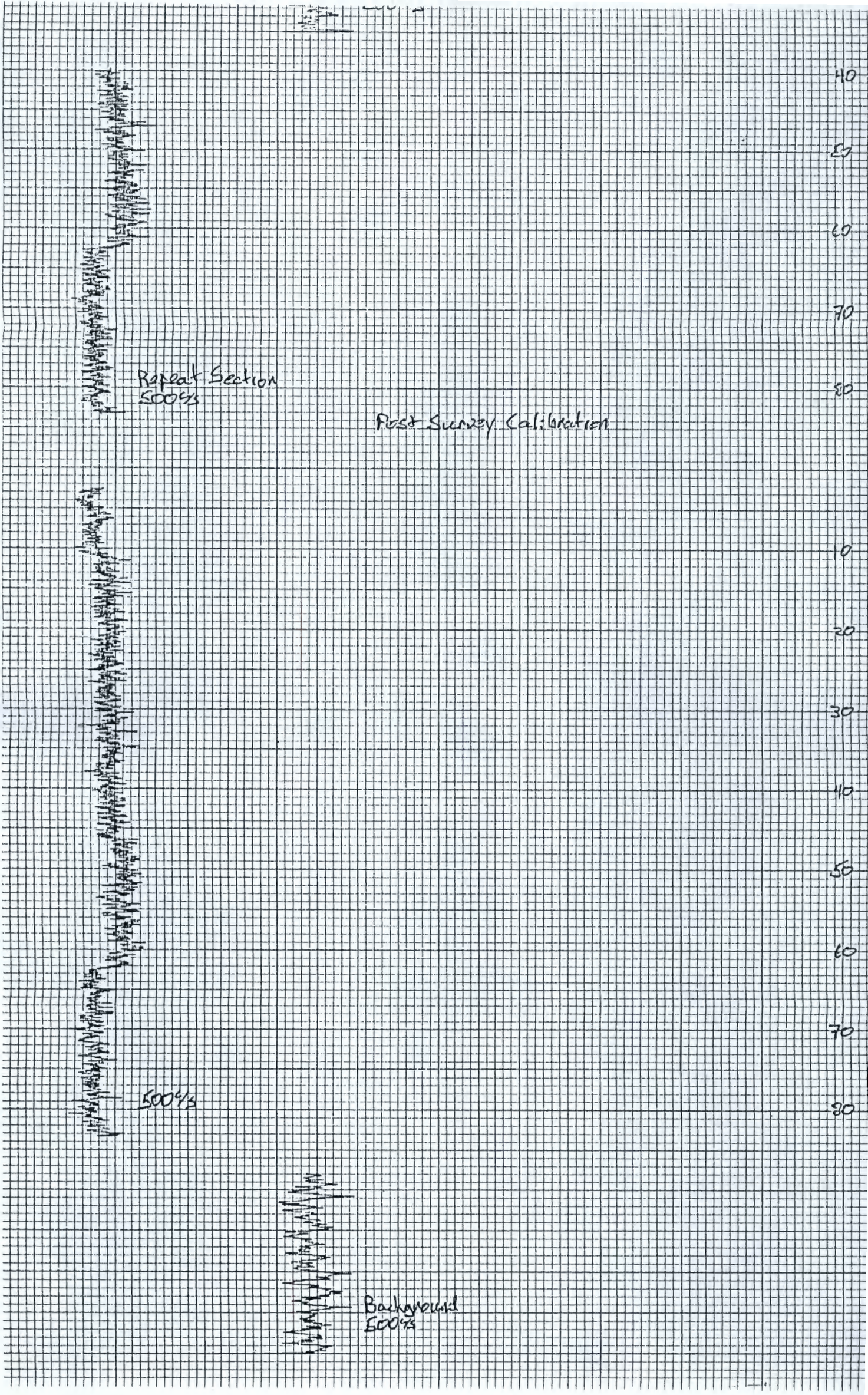
Post Survey Verification: Position 1: 293.9 eU — Position 2: 62.3 eU — Background: 175 c/s

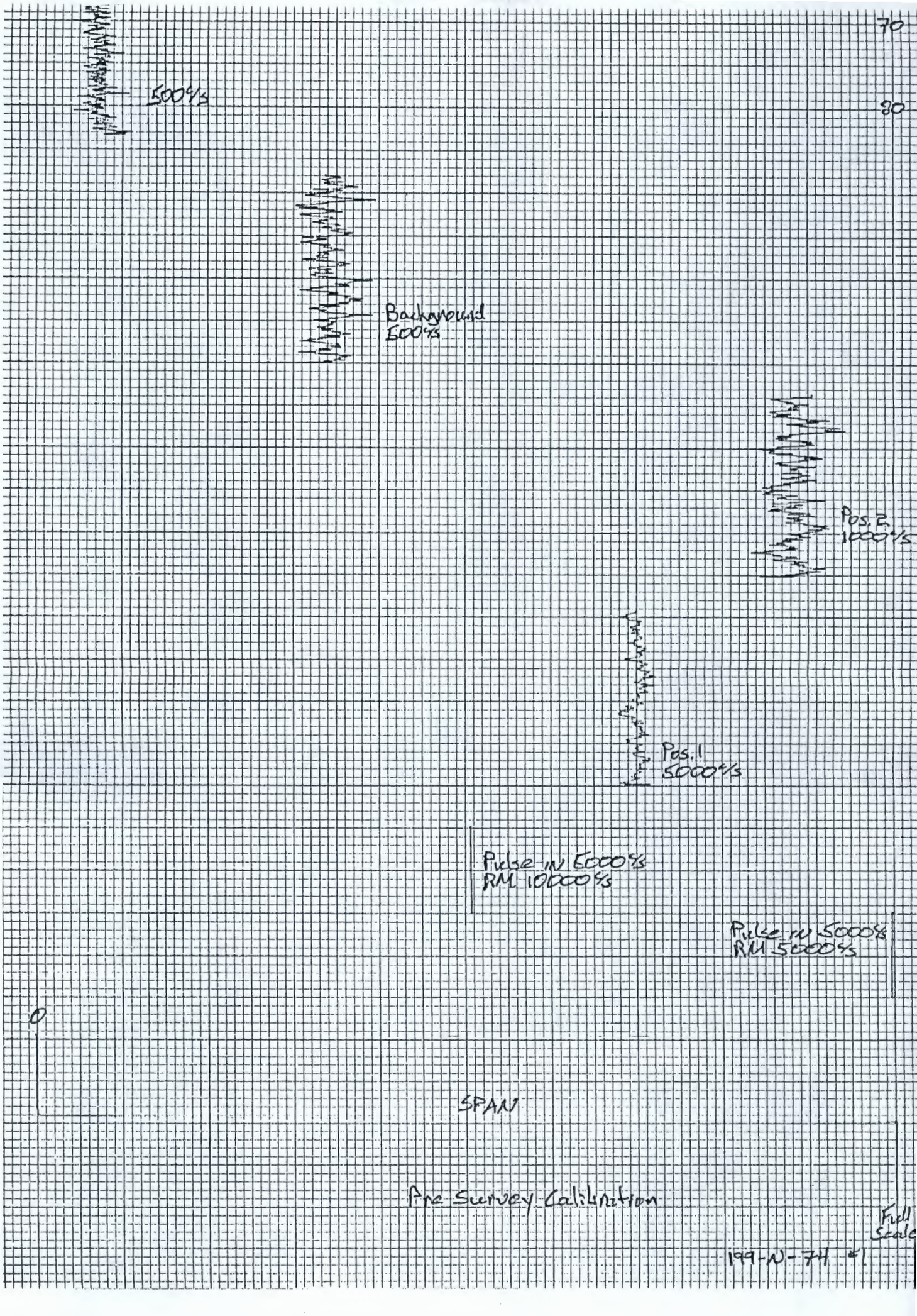
Percent Change: Position 1: 0.2% — Position 2: 1.4%

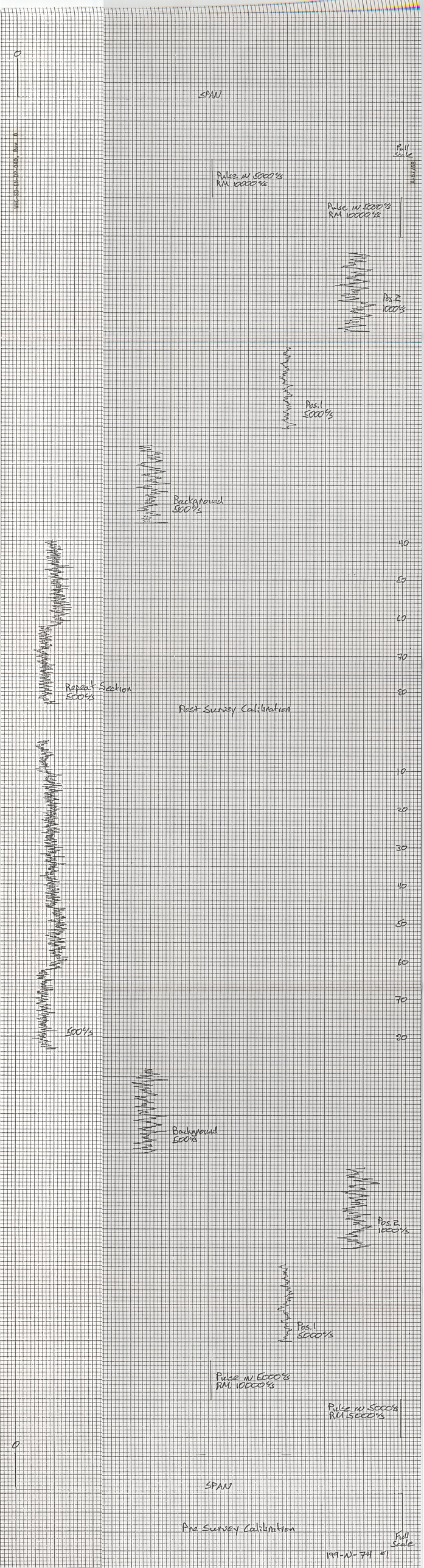
Comments: Return Error = +0.2' high
Centralizer used

Witnessed and Verified by: (sign and print name) Alan Pearson Alan Pearson — Date: 8/29/91


0
SPAN
WHC-SD-EN-DP-040, Rev. 0
Pulse IN 5000 Hz
RM 10000 Hz
Full Scale
Pulse IN 5000 Hz
RM 10000 Hz
Pos. 2
1000 Hz
Pos. 1
5000 Hz
Background
500 Hz
40
50
60
70


40
50
60
70
80
Repeat Section
500%
Post Survey Calibration
10
20
30
40
50
60
70
80
500%
Background
500%


70
80
500%
Background
500%
Pos. 2
1000%
Pos. 1
5000%
Pulse IN 5000%
RM 10000%
Pulse IN 5000%
RM 5000%
0
SPAN
Pre Survey Calibration
Full Scale
199-N-74 #1


0
SPAN
Full Scale
Pulse IN 5000%
RM 10000%
Pulse IN 5000%
RM 10000%
Pos. R
1000%
Pos. I
5000%
Background
500%
40
50
60
70
80
Repeat Section
500%
Post Survey Calibration
10
20
30
40
50
60
70
80
500%
Background
500%
Pos. R
1000%
Pos. I
5000%
Pulse IN 5000%
RM 10000%
Pulse IN 5000%
RM 5000%
0
SPAN
Pre Survey Calibration
Full Scale
199-N-74 #1

APPENDIX B

SEDIMENT SAMPLE DATA

This appendix includes for each well grain size data, $CaCO_3$ data, and moisture data.

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WELL 199-N-71

9413274.0080

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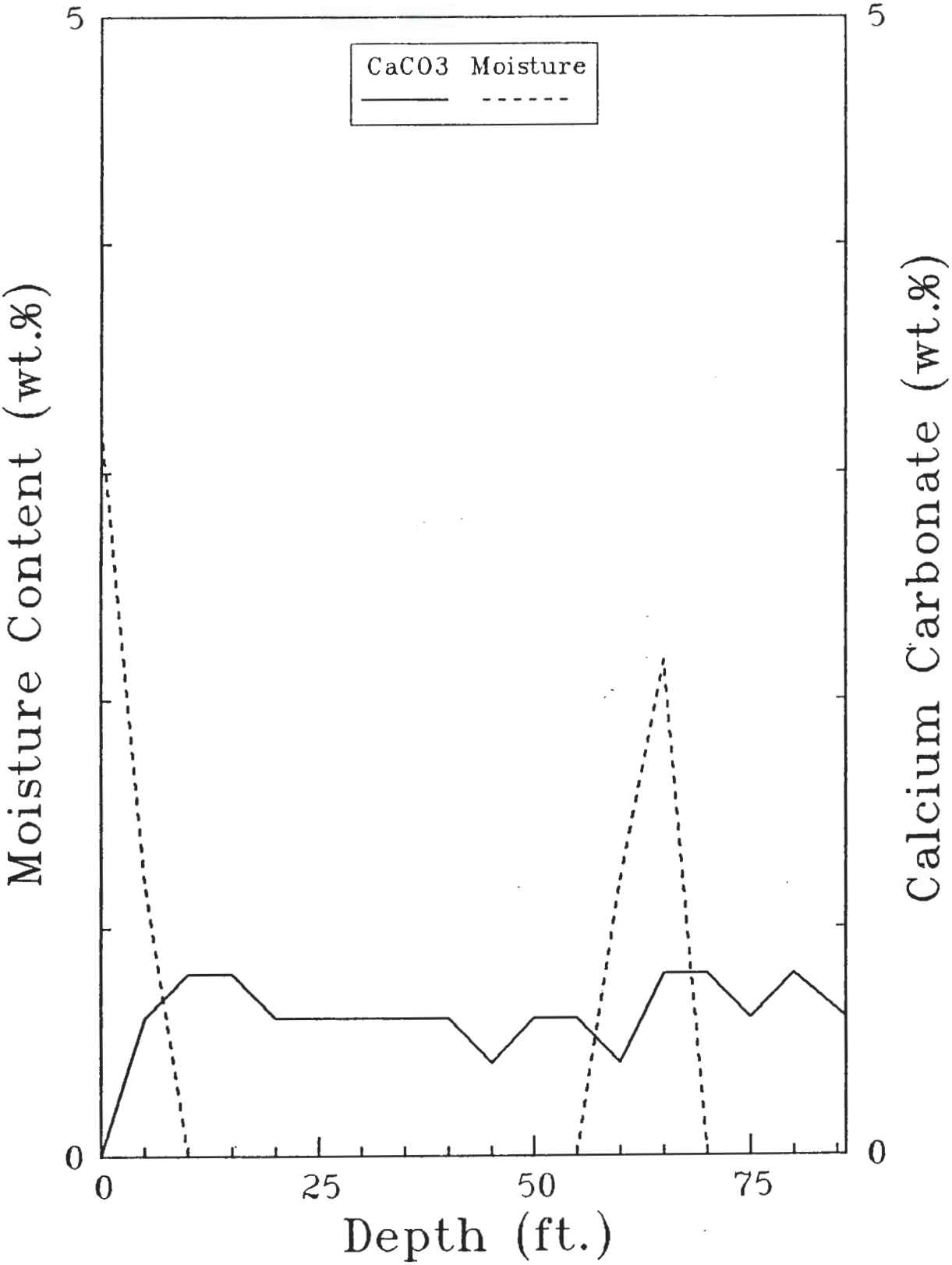
VALIDATED
KDR 2/19/92
SIGNATURE/DATE

172

WELL 199-N-71



232

	A	B	C
1	WELL 199-N-71		
2			
3	Depth	CaCO3	Moisture
4	ft.	Wt. %	Wt. %
5			
6	0	0	3.20
7	5	0.6	1.20
8	10	0.8	
9	15	0.8	
10	20	0.6	
11	25	0.6	
12	30	0.6	
13	36	0.6	
14	40	0.6	
15	45	0.4	
16	50	0.6	
17	55	0.6	
18	60	0.4	1.21
19	65	0.8	2.17
20	70	0.8	
21	75	0.6	
22	80	0.8	
23	85-87	0.6	

KDR
10/16/91
10-20 sml
20 slot

TEST REQUEST

SAMPLE/SPECIMEN NO. 2-0007 COST CODE/WORK ORDER NO. R331B

REQUESTED BY: ORG. 81231 PERSON B. WILLIAMS DATE 10-10-91

TEST REQUESTED	NO. OF SAMPLES	TEST LAB INFORM... (PROCEDURE USED)
SIEVE ANALYSIS	1	GEL-07

REMARKS 199-N-71
85-87.0'

RECEIVED BY: R.G. ALEXANDER DATE 10-10-91

APPROVED BY: R.G. ALEXANDER DATE 10-10-91

RADIATION RELEASE

Bldg. 199-N-71 Expiration Date 9-12-91

Released By TEC
Health Physics

Remarks 85'-87'

54-3000-022 (01/89)

RADIATION RELEASE

Bldg. 199-N-71 Expiration Date 9-12-91

Released By TEC
Health Physics

Remarks 85'-87'

54-3000-022 (01/89)

SIEVE ANALYSIS DATA SHEET

Sample No. R-0007 Page 1 of 1

Tested By: JERRY L. ENGLAND		Date	10-15-91
Procedure No: GEE-07		Rev. 1	Date Issued 11-15-89
Test Plan No: N/A		Rev. N/A	Date Issued N/A
Balance:	ETAL- 3310	Calibration Due Date	12-25-91
Thermometer:	ETAL- 013	Calibration Due Date	9-16-92
N/A :	ETAL- N/A	Calibration Due Date	N/A
N/A :	ETAL- N/A	Calibration Due Date	N/A
N/A :	ETAL- N/A	Calibration Due Date	N/A
N/A :	ETAL- N/A	Calibration Due Date	N/A

Sample Description SANDY GROVEL Sieve Time 10 (min)

Reduced by (X) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
2	1461.3	0	0	100
1½	↓	0	0	100
1	↓	184.7	12.6	87.4
3/4	↓	229.4	15.7	84.3
½	↓	303.6	20.8	79.2
3/8	↓	367.5	25.2	74.8
4	↓	517.2	35.4	64.6
10	135.6	27.9	20.6	51.3
40	↓	72.4	53.4	30.1
60	↓	99.7	73.5	17.1
100	↓	110.8	81.7	11.8
200	↓	119.0	87.8	7.9

Finess Modules (FM) N/A (See ASTM C 136-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	WASHED FINE GRADING
E = Dry Weight of Sample After Washing/Sieve	N/A g	
C = <(D-E)/D>*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By; R.G. ALEXANDER Date 10-16-91

A-6400-204(2-87)

9413229.0086

GRAIN SIZE ANALYSIS PLOT

Sample No. 2-0007

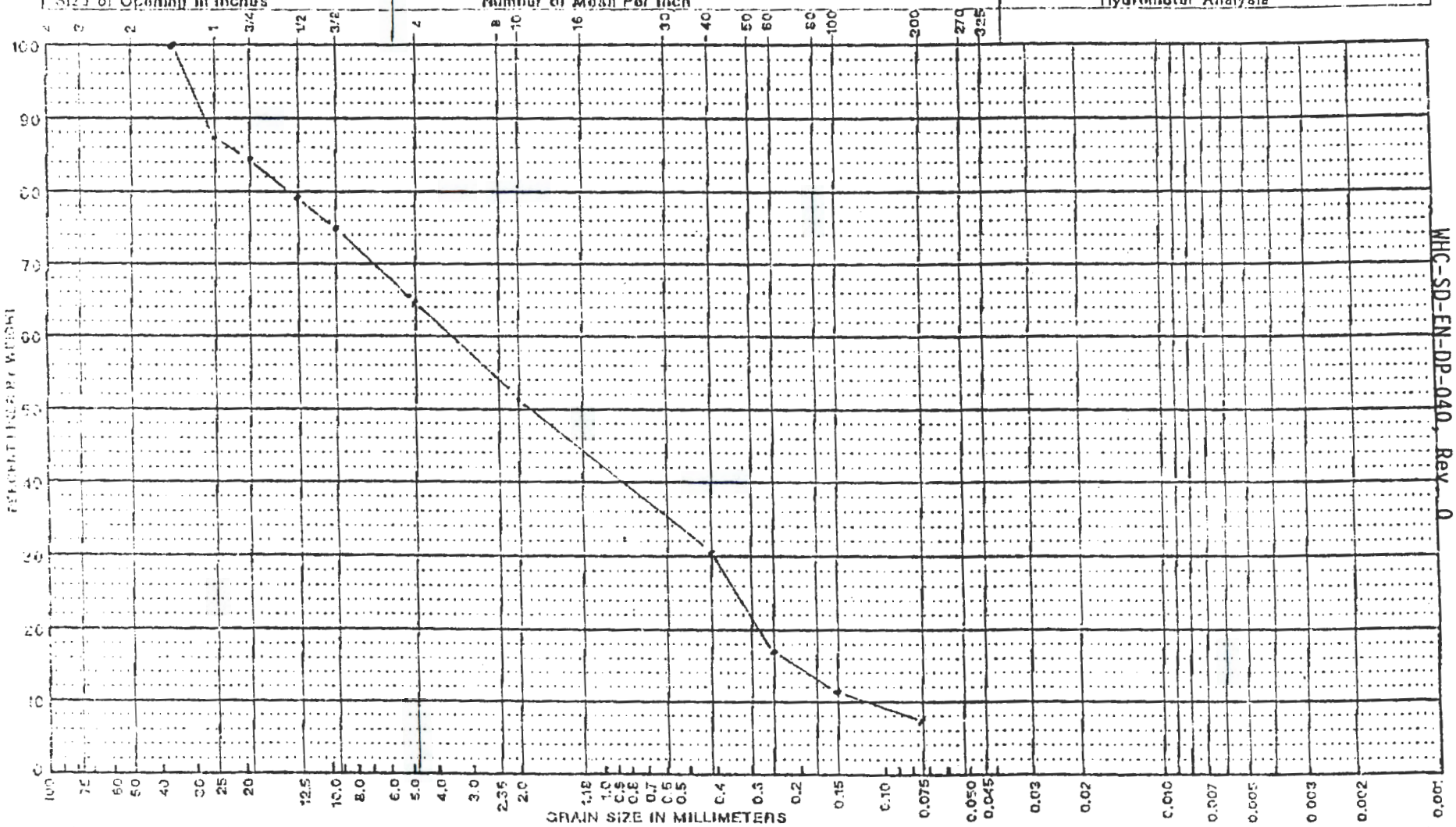
Page 1 of 1

Procedure No. GEL-07 Rev. 1 Date Issued 11-16-89

Plotted By JERRY L. ENGLAND

Test Plan No. N/A Rev. N/A Date Issued N/A

Date 10-15-91



Remarks SANDY GRAVEL

197-N-71 95-97.0'

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By: R.G. ALEXANDER Date 10-16-91

WHC-SD-EN-DP-040, Rev. 0

SIEVE ANALYSIS DATA SHEET

Sample No. 2-00007 Page 1 of 1

Tested By: TERRY L ENGLAND Date 10-16-91
Procedure No: GEL-07 Rev. 1 Date Issued 11-16-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 3310 Calibration Due Date 12-25-91
Thermometer: ETAL- 018 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A

Sample Description SAND Sieve Time 10 (min)

Reduced by (X) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
4	135.6	0	0	100
10	↓	27.9	20.6	79.4
40	↓	72.4	53.4	46.6
60	↓	99.7	73.5	26.5
100	↓	110.8	81.7	18.3
200	↓	119.0	87.8	12.2
N/A	N/A	N/A	N/A	N/A
↓	↓	↓	↓	↓

Finess Modules (FM) N/A (See ASTM C 136-85, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	WASHED GRADING
E = Dry Weight of Sample After Washing/Sieve	N/A g	
C = <(D-E)/D>*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By; R.G. ALEXANDER Date 10-16-91

A-6400-204(2-87)

9413224.0089

GRAIN SIZE ANALYSIS PLOT

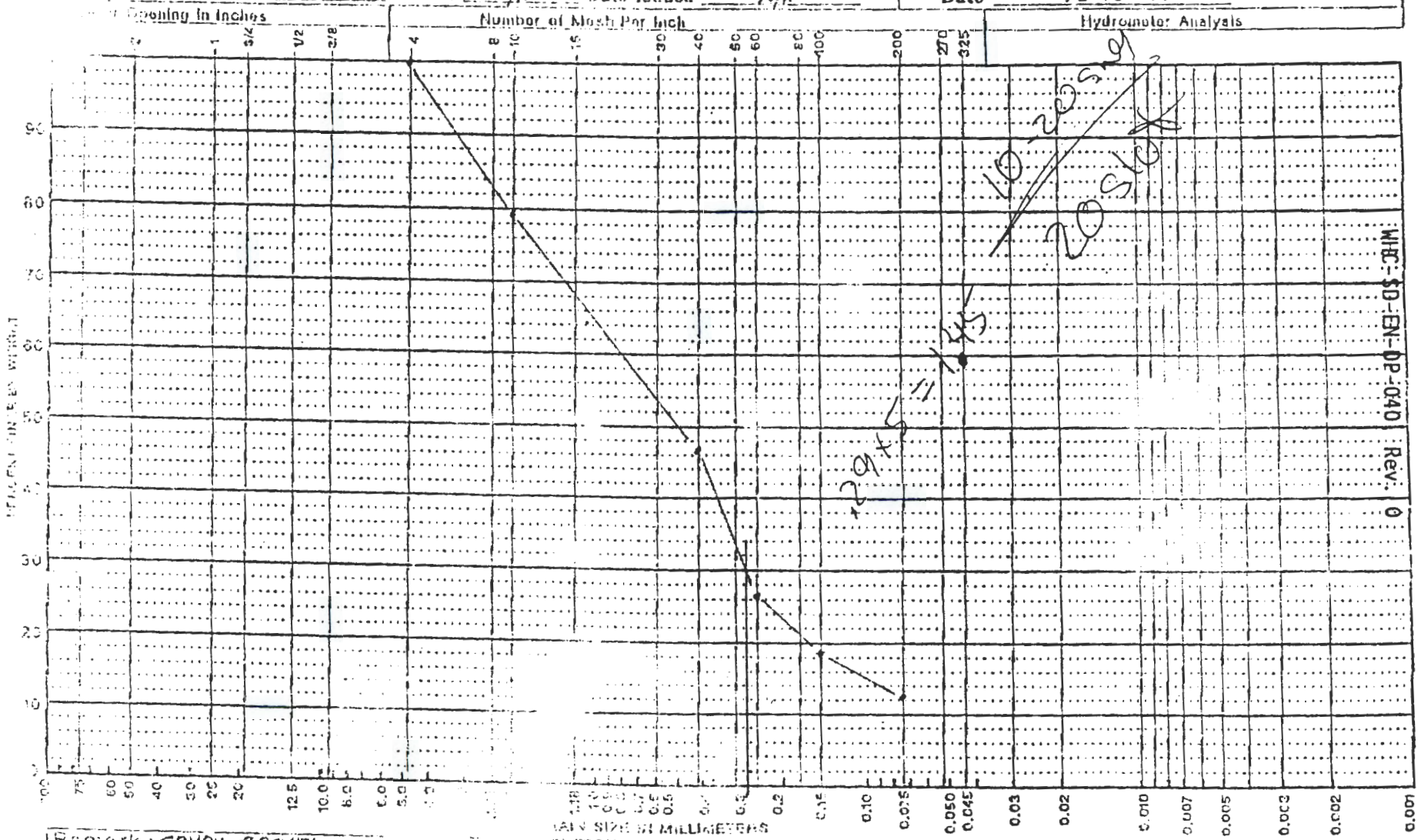
Sample No. 2.0007 — Page 1 of 1

Procedure No. SEL-07 — Rev. 1 — Date Issued [illegible]

Test Plan No. N/A — Rev. N/A — Date Issued N/A

Plotted By JERRY L. ENGLAND

Date 10-16-91



Remarks SANDY GRAVEL

199-N-71 97.5'

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By R.G. ALEXANDER Date 10-16-91

WHC-SD-EN-DP-040 Rev. 0

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9413274.0089

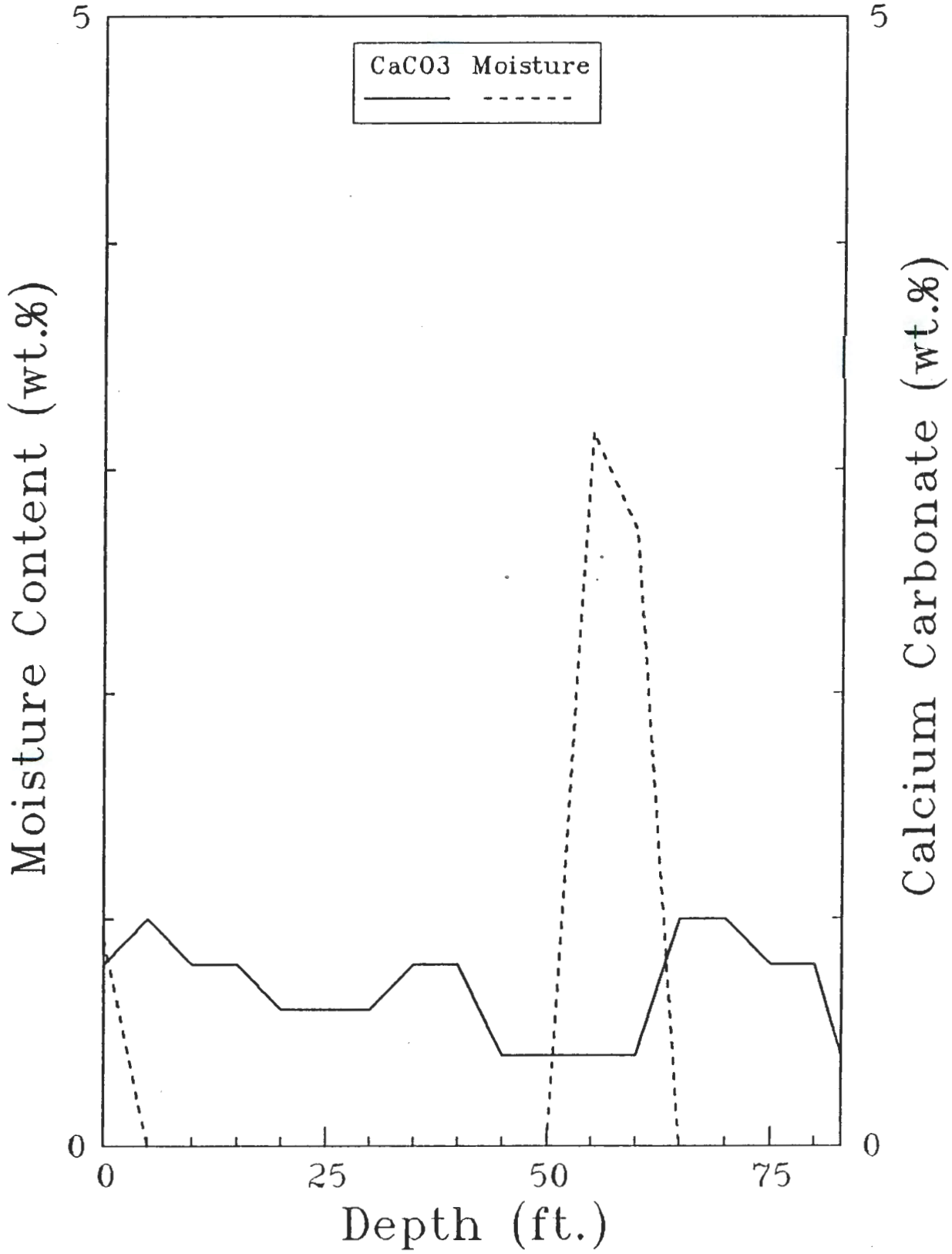
9413274.0090

WELL 199-N-72

VALIDATED
KDR 2/19/92
SIGNATURE/DATE

192

WELL 199-N-72



292

	A	B	C
1	WELL 199-N-72		
2			
3	Depth	CaCO3	Moisture
4	ft.	Wt. %	Wt. %
5			
6	0	0.8	0.91
7	5	1	
8	10	0.8	
9	15	0.8	
10	20	0.6	
11	25	0.6	
12	30	0.6	
13	35	0.8	
14	40	0.8	
15	45	0.4	
16	50	0.4	
17	55	0.4	3.16
18	60	0.4	2.73
19	65	1	
20	70	1	
21	75	0.8	
22	80	0.8	
23	82-83	0.4	

9413274.0092

10/14/91
KDR
20 slot
10-20 Sand

TEST REQUEST

SAMPLE/SPECIMEN NO. 2-0004 COST CODE/WORK ORDER NO. R331H

REQUESTED BY: ORG. 81231 PERSON B. WILLIAMS DATE 10-10-91

TEST REQUESTED	NO. OF SAMPLES	TEST LAB INFORMATION (PROCEDURE USED)
SIEVE ANALYSIS	1	GEL-07

REMARKS 199-N-72
82-83.0'

RECEIVED BY: R.G. ALEXANDER DATE 10-10-91

APPROVED BY: R.G. ALEXANDER DATE 10-10-91

RADIATION RELEASE

Bldg. 199 N-72 Expiration Date 10/09/91

Released By [signature]
Health Physics

Remarks 82-83

54-3000-022 (01/89)

RADIATION RELEASE

Bldg. 199 N-72 Expiration Date 10/09/91

Released By [signature]
Health Physics

Remarks 82-83

54-3000-022 (01/89)

SIEVE ANALYSIS DATA SHEET

Sample No. 2 — 0004 Page 1 of 1

Tested By: R.G. ALEXANDER Date 10-14-91
Procedure No: GEL-07 Rev. 1 Date Issued 11-15-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 3310 Calibration Due Date 12-25-91
Thermometer: ETAL- 0013 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
: ETAL- Calibration Due Date
: ETAL- Calibration Due Date
: ETAL- Calibration Due Date

Sample Description SANDY GRAVEL Sieve Time 10 (min)

Reduced by ( ) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
2"	1360.8	Ø	Ø	100
1½		366.6	26.9	73.1
1		405.1	29.8	70.2
3/4		486.7	35.8	64.2
1/2		641.5	47.1	52.9
3/8		706.5	51.9	48.1
#4		817.8	60.1	39.9
#10	130.6	24.5	18.8	32.4
#40		65.8	50.4	19.8
#60		94.6	72.4	14.0
#100		112.3	86.0	5.6
#200		120.5	92.3	3.1

Fineness Modules (FM) N/A (See ASTM C 136-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	
E = Dry Weight of Sample After Washing/Sieve	N/A g	WASH GRADING
C = ((D-E)/D)*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By: [signature] Date 10-14-91

A-6400-204(2-87)

GRAIN SIZE ANALYSIS PLOT

Sample No. 2-0004

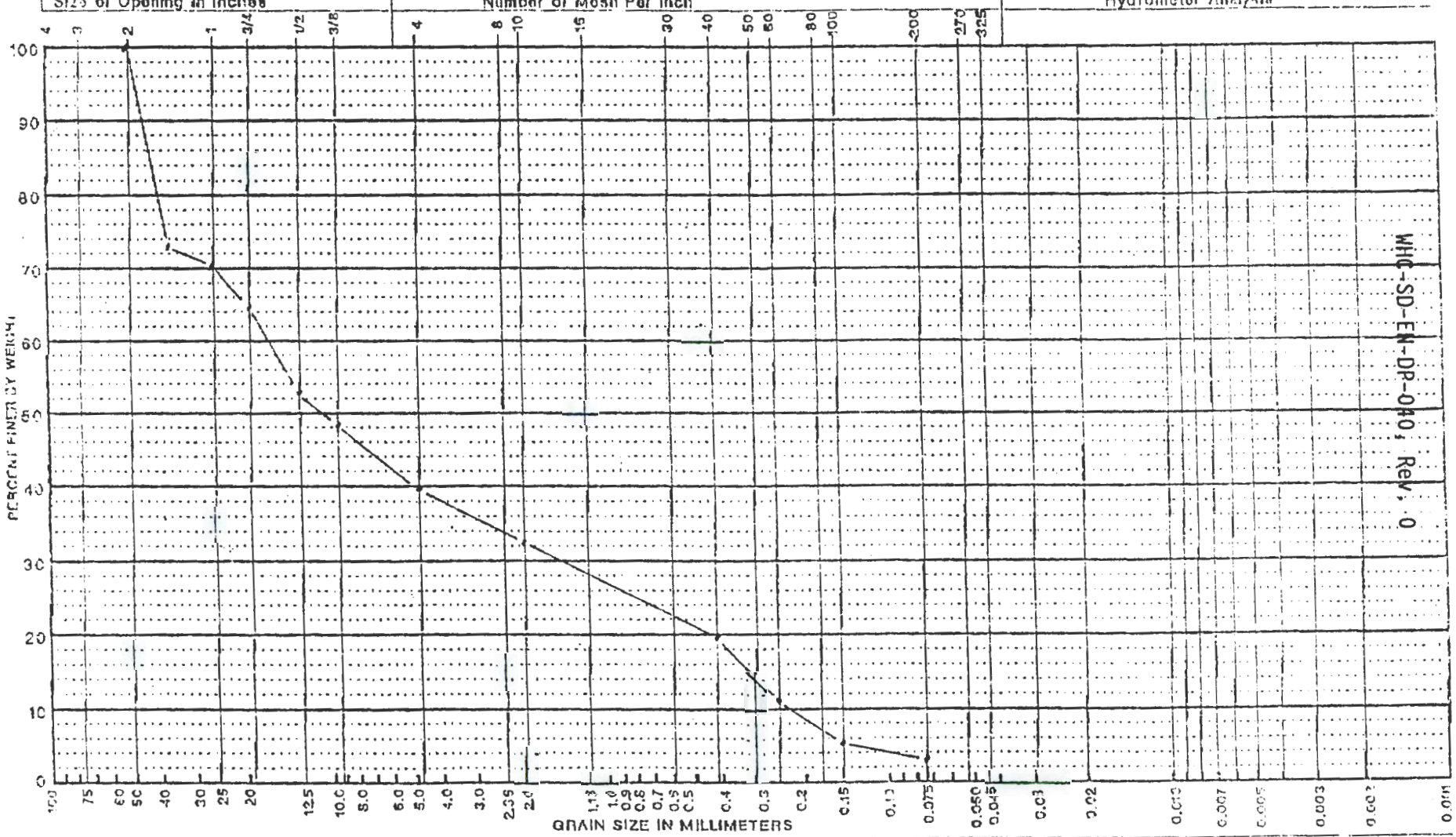
Page 1 of 1

Procedure No. GEL-07 Rev. 1 Date Issued 11-15-89

Plotted By JERRY L. ENGLAND

Test Plan No. N/A Rev. N/A Date Issued N/A

Date 10-14-91



Remarks SANDY GRAVEL

199-N-72 82-83.0'

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By: M. A. Dachler Date 10-14-91

SIEVE ANALYSIS DATA SHEET

Sample No. 2 0004 Page 1 of 1

Tested By: Terry L. England Date 10-14-91
Procedure No: GEL-07 Rev. 1 Date Issued 11-15-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 3310 Calibration Due Date 12-25-91
Thermometer: ETAL- 013 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A

Sample Description SAND Sieve Time 10 (min)

Reduced by (X) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
4	130.6	0	0	100
10	↓	24.5	18.8	81.2
40	↓	65.8	50.4	49.6
60	↓	94.6	72.4	27.6
100	↓	112.3	86.0	14.0
200	↓	120.5	92.3	7.7
N/A	N/A	N/A	N/A	N/A
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓

Finess Modules (FM) N/A (See ASTM C 135-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	WASHED GRADING
E = Dry Weight of Sample After Washing/Sieve	N/A g	
C = <(D-E)/D>*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By; M. A. Bacon Date 10-14-91

A-6400-204(2-87)

GRAIN SIZE ANALYSIS PLOT

Sample No. Z-0004 Page 1 of 1

Procedure No. GEL-07 Rev. 1 Date Issued 11-15-89 Plotted By JERRY L. ENGLAND

Test Plan No. N/A Rev. N/A Date Issued N/A Date 10-14-91

Remarks SAND

199-N-72

92-2

All data are accurately and completely recorded. The test operator was qualified and used calibrated instruments.

Date 10-14-91

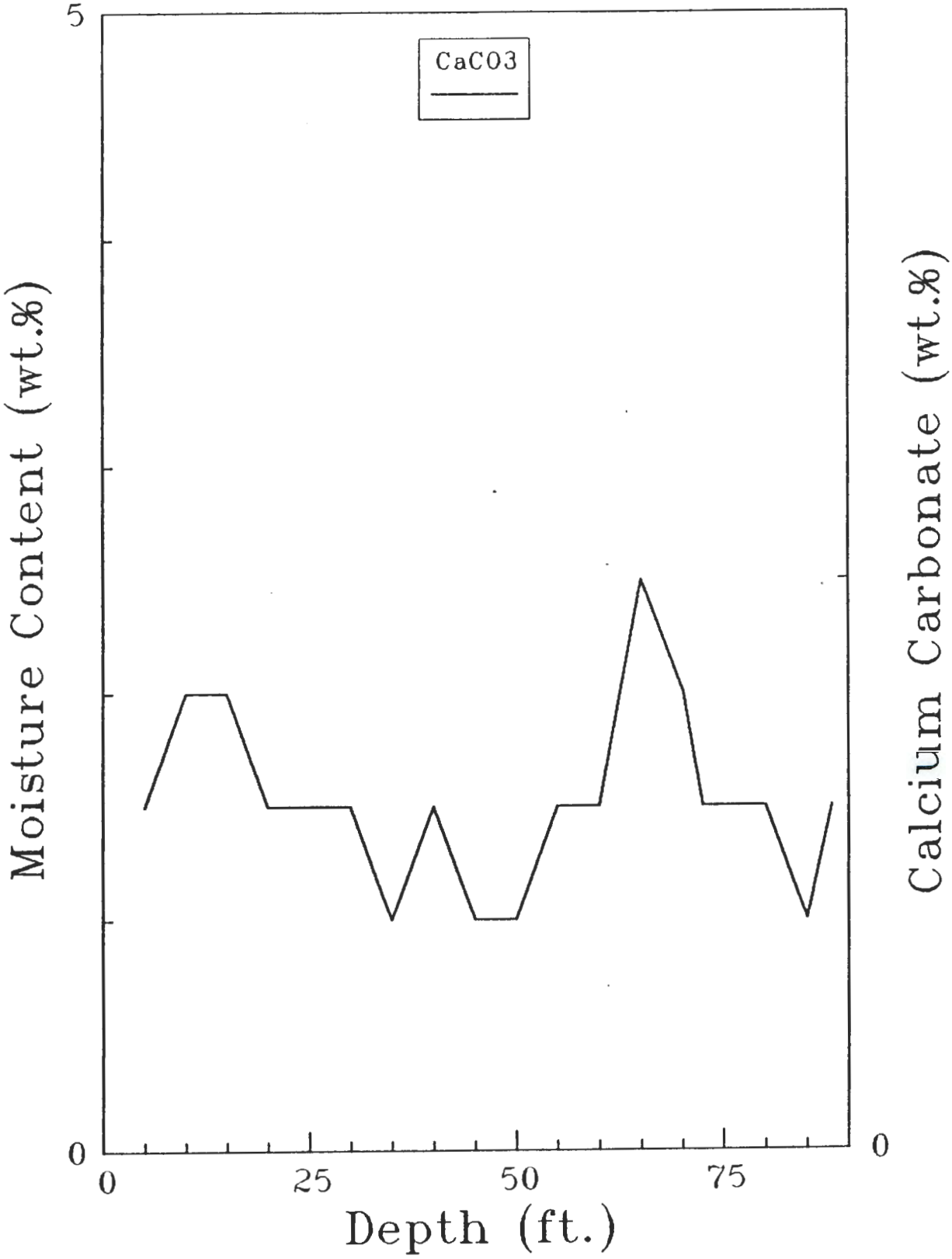
9413224.0098

WELL 199-N-73

192

VALIDATED
ISD 7/19/92
SIGNATURE/DATE

WELL 199-N-73



9413224.0099

2-92

	A	B
1	WELL 199-N-73	
2		
3	Depth	CaCO3
4	ft.	Wt. %
5		
6	5	0.6
7	10	0.8
8	15	0.8
9	20	0.6
10	25	0.6
11	30	0.6
12	35	0.4
13	40	0.6
14	45	0.4
15	50	0.4
16	55	0.6
17	60	0.6
18	65	1
19	70	0.8
20	72.1-73.6	0.6
21	75	0.6
22	80	0.6
23	85	0.4
24	87.4-89.1	0.6

KDR
10/14/91
20 slot
10-20 sand

TEST REQUEST

SAMPLE/SPECIMEN NO. [illegible] COST CODE/WORK ORDER NO. E331H

REQUESTED BY: ORG. 81231 PERSON B. WILLIAMS DATE 10-10-91

TEST REQUESTED	NO. OF SAMPLES	TEST LAB INFORMATION (PROCEDURE USED)
SIEVE ANALYSIS	1	GEL-07

REMARKS 199-N-73
72.1-73.6

RECEIVED BY: R.G. ALEXANDER DATE 10-10-91

APPROVED BY: R.G. ALEXANDER DATE 10-10-91

RADIATION RELEASE

Bldg. 199 N73 Expiration Date 8-22-91

Released By TEC
Health Physics

Remarks 72.1-73.6

54-3000-022 (01/89)

RADIATION RELEASE

Bldg. 199 N73 Expiration Date 8-22-91

Released By TEC
Health Physics

Remarks 72.1-73.6

54-3000-022 (01/89)

SIEVE ANALYSIS DATA SHEET

Sample No. 2-10005 Page 1 of 1

Tested By: R.G. ALEXANDER Date 10-14-91
Procedure No: GEL-07 Rev. 1 Date Issued 11-15-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 3310 Calibration Due Date 12-25-91
Thermometer: ETAL- 2013 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
: ETAL- Calibration Due Date
: ETAL- Calibration Due Date
: ETAL- Calibration Due Date

Sample Description SANDY GRAVEL Sieve Time: 10 (min)

Reduced by ⊗ Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
2"	1051.6	Ø	Ø	100
1 1/2		253.1	24.1	75.9
1		332.3	31.6	68.4
3/4		332.3	31.6	68.4
1/2		387.7	36.9	63.1
3/8		425.1	40.4	59.6
#4		514.9	49.0	51.0
#10	154.3	37.5	24.5	38.5
#40		77.9	50.5	25.4
#60		104.1	67.5	~~Etal~~ MAB 16.6
#100		118.5	76.8	11.8
#200		129.3	83.8	8.3

Finess Modules (FM) N/A (See ASTM C 136-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING

C = Percentage of material passing a 200 Sieve N/A %
D = Original Dry Weight of Sample N/A g
E = Dry Weight of Sample After Washing/Sieve N/A g
C = <(D-E)/D>*100

Remarks
WASH GRADING

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By; M. A. Gaechler Date 10-14-91

A-6400-204(2-87)

GRAIN SIZE ANALYSIS PLOT

Sample No. 2.0005

Page 1 of 1

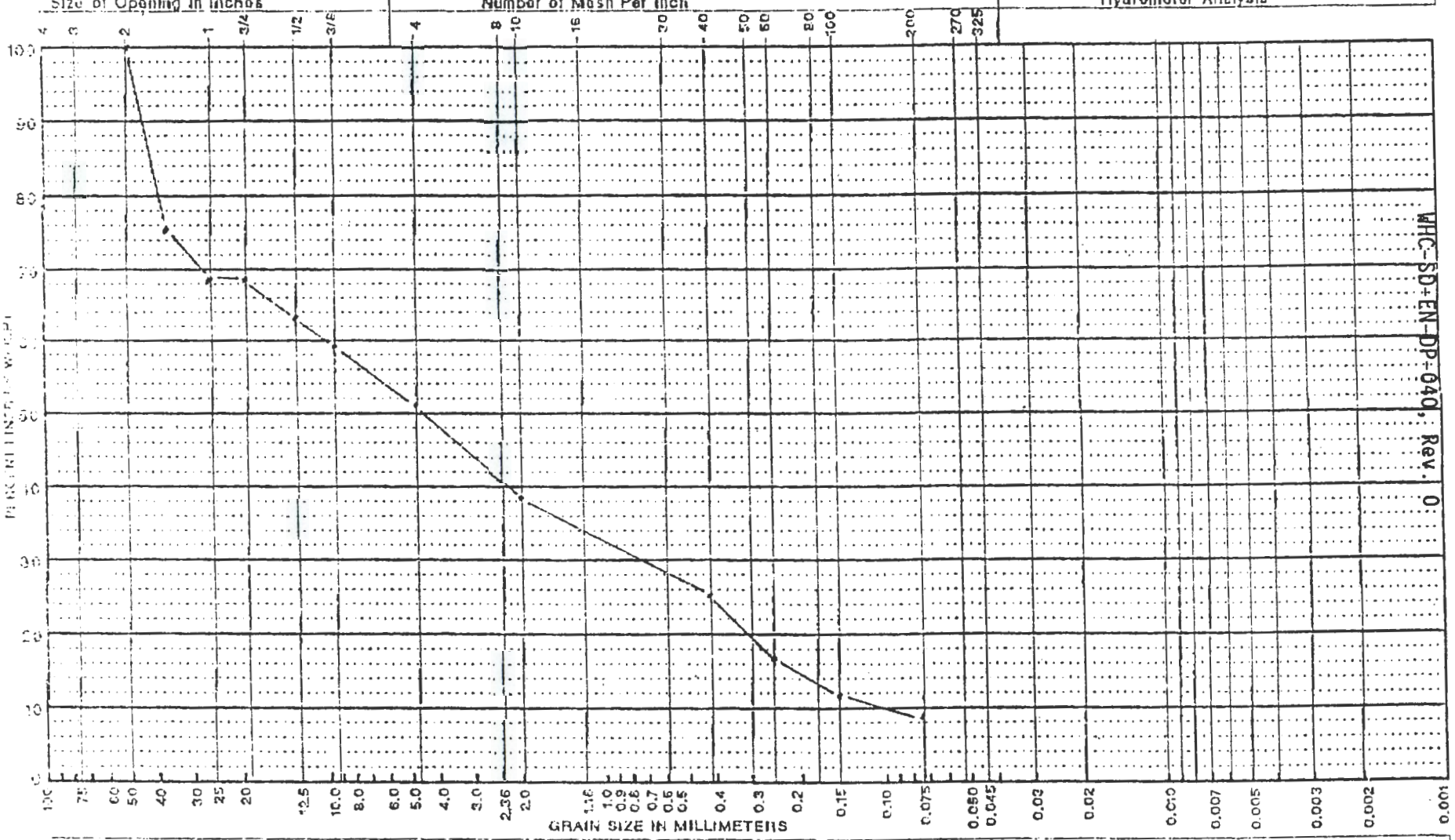
Procedure No. GEL-07 Rev. 1 Date Issued 11-15-89

Plotted By JERRY LONGLAND

Test Plan No. N/A Rev. N/A Date Issued N/A

Date 10-14-81

Size of Opening In Inches | Number of Mesh Per Inch | Hydrometer Analysis



Remarks SANDY GRAVEL

199-N-73 72.1-73.6'

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By: _____ Date _____

WHC-SD-EN-DP-040, Rev. 0

SIEVE ANALYSIS DATA SHEET

Sample No. 2-0005 Page 1 of 1

Tested By: JERRY L. ENGLAND Date 10-14-91
Procedure No: 62-07 Rev. 1 Date Issued 11-15-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 5310 Calibration Due Date 12-25-91
Thermometer: ETAL- 013 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A

Sample Description SAND Sieve Time 10 (min)

Reduced by (X) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
4	154.3	0	0	100
10	↓	37.8	24.5	75.5
40	↓	77.9	50.5	49.5
60	↓	104.1	67.5	32.5
100	↓	118.5	76.8	23.2
200	↓	129.3	83.8	17.2
N/A	N/A	N/A	N/A	N/A
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓
↓	↓	↓	↓	↓

Finess Modules (FM) N/A (See ASTM C 136-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	WASHED GRADING
E = Dry Weight of Sample After Washing/Sieve	N/A g	
C = <(D-E)/D>*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By; M. G. Buechler Date 10-14-91

A-6400-204(2-87)

GRAIN SIZE ANALYSIS PLOT

Sample No. 2.0005 Page 1 of 1

Procedure No. GG-07 Rev. 1 Date Issued 11-26-91 Plotted By JERRY L. ENGLAND

Test Plan No. N/A Rev. N/A Date Issued N/A Date 10-14-91

Remarks SAND

199-N-73 72.1 - 73.6

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By: M. G. Baechler Date 10-14-91

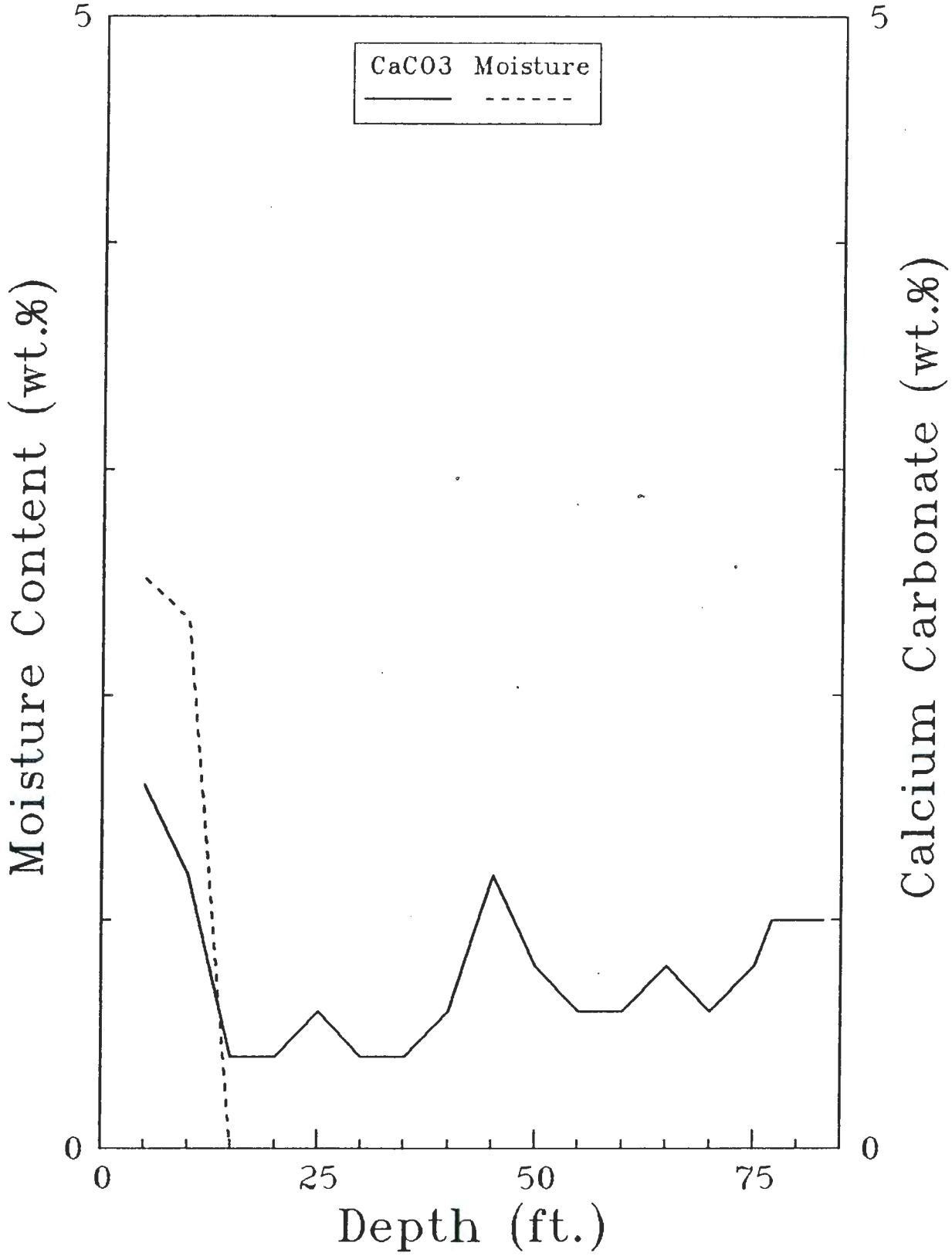
9413224.0106

WELL 199-N-74

VALIDATED KDR 3/19/92 SIGNATURE/DATE

192

WELL 199-N-74



292

	A	B	C
1	WELL 199-N-74		
2			
3	Depth	CaCO3	Moisture
4	ft.	Wt. %	Wt. %
5			
6	5	1.6	2.51
7	10	1.2	2.33
8	15	0.4	
9	20	0.4	
10	25	0.6	
11	30	0.4	
12	35	0.4	
13	40	0.6	
14	45	1.2	
15	50	0.8	
16	55	0.6	
17	60	0.6	
18	65	0.8	
19	70	0.6	
20	75	0.8	
21	77	1	
22	80	1	
23	82-84	1	

10/16/91
10 slot
20-40 snal
KDR

TEST REQUEST

SAMPLE/SPECIMEN NO. 2-0006 COST CODE/WORK ORDER NO. R331H

REQUESTED BY: ORG. 81231 PERSON B. WILLIAMS DATE 10-10-91

TEST REQUESTED	NO. OF SAMPLES	TEST LAB INFORMATION (PROCEDURE USED)
SIEVE ANALYSIS	1	GEL-07

REMARKS 199-N-74 77.0'

RECEIVED BY: R.G. ALEXANDER DATE 10-10-91

APPROVED BY: R.G. ALEXANDER DATE 10-10-91

RADIATION RELEASE

Bldg. 199-N-74 Expiration Date 8-22-91

Released By [signature] Health Physics

Remarks 77

54-3000-022 (01/89)

RADIATION RELEASE

Bldg. 199-N-74 Expiration Date 8-22-91

Released By [signature] Health Physics

Remarks 77

54-3000-022 (01/89)

SIEVE ANALYSIS DATA SHEET

Sample No. 2.6006 Page 1 of 1

Tested By: JERRY L. ENGLAND Date 12-15-91
Procedure No: GEC-07 Rev. 1 Date Issued 11-15-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 3310 Calibration Due Date 12-25-91
Thermometer: ETAL- 013 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A

Sample Description SANDY GRAVEL Sieve Time 10 (min)

Reduced by (X) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
2	1311.8	0	0	100
1½		385.6	31.8	68.2
1		426.6	35.2	64.8
3/4		543.5	44.9	55.1
½		653.5	53.9	46.1
3/8		733.7	~~60.8~~ 60.5	~~39.2~~ 39.5
4		815.7	67.3	32.7
10	103.7	19.6	18.9	81.1 ~~26.8~~
40		40.4	37.2	~~19.6~~ 20.5
60		60.5	55.7	44.5
100		76.7	70.6	29.4
200		86.2	79.3	20.8

Finess Modules (FM) N/A (See ASTM C 136-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	WASHED FINE GRADING
E = Dry Weight of Sample After Washing/Sieve	N/A g	
C = <(D-E)/D>*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By: R. WINN J. McGuffey Date 5/1/92 6/10/92

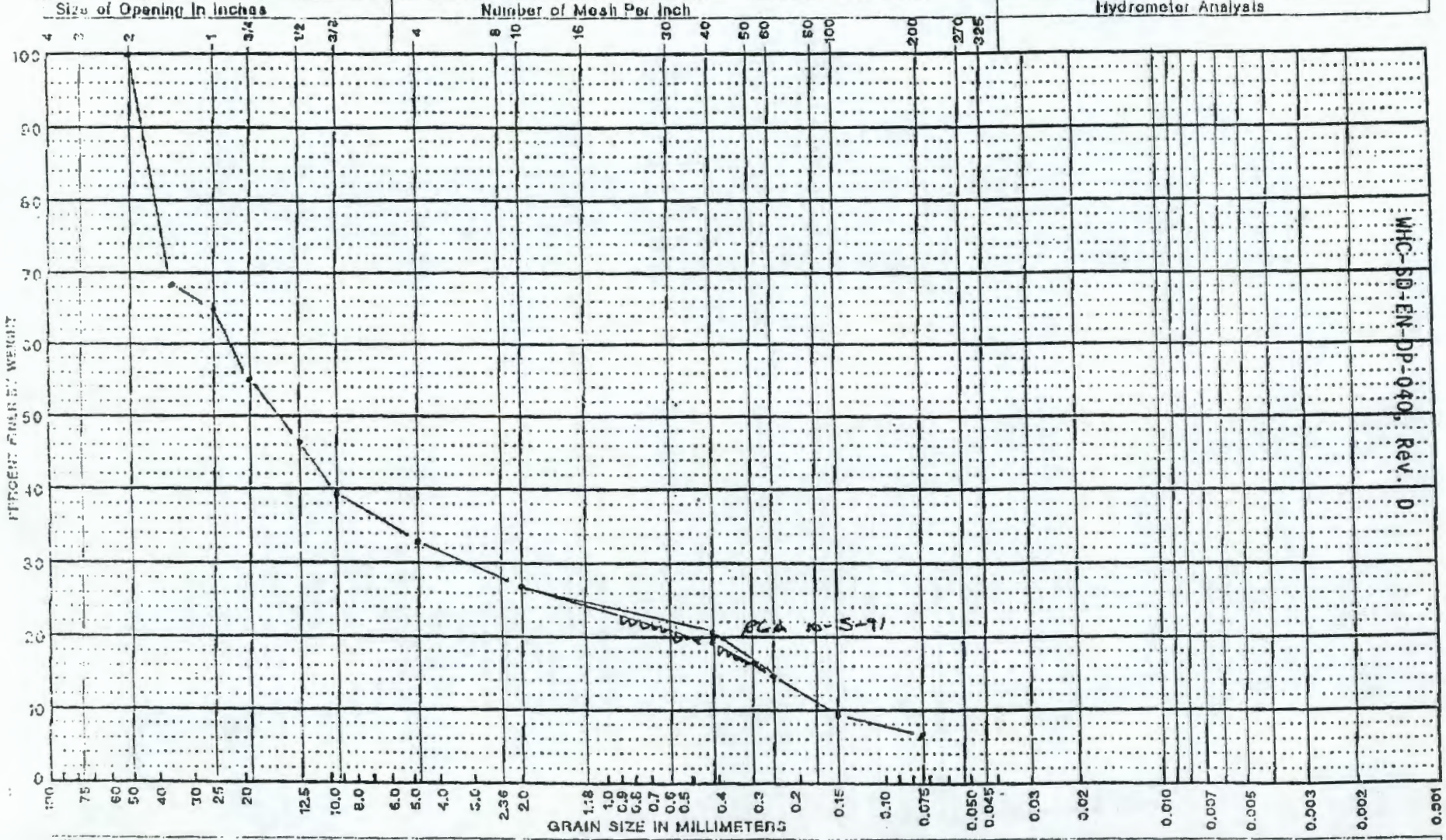
A-6400-204(2-87)

GRAIN SIZE ANALYSIS PLOT

Sample No. 2.0006 Page 1 of 1

Procedure No. GEL-07 Rev. 1 Date Issued 11-15-89 Plotted By JERRY L. ENGLAND

Test Plan No. N/A Rev. N/A Date Issued N/A Date 10-15-91



Remarks SANDY GRAVEL

199-N-74 77'

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By: R.G. ALEXANDER Date 10-15-91

SIEVE ANALYSIS DATA SHEET

Sample No. 2-0006 Page 1 of 1

Tested By: JERRY L. ENGLAND Date 10-15-91
Procedure No: GEL-07 Rev. 1 Date Issued 11-15-89
Test Plan No: N/A Rev. N/A Date Issued N/A
Balance: ETAL- 2310 Calibration Due Date 12-25-91
Thermometer: ETAL- 013 Calibration Due Date 9-16-92
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A
N/A : ETAL- N/A Calibration Due Date N/A

Sample Description SAND Sieve Time 10 (min)

Reduced by (X) Splitting ( ) Quartering ( ) Stockpile

Sieve Size	Sample Weight	Cumulative Wt. Retained	Cumulative % Retained	Cumulative % Passed
4	108.7	0	0	100
10	↓	19.6	18.0	82.0
40	↓	40.4	37.2	62.8
60	↓	60.6	55.7	44.3
100	↓	76.7	70.6	29.4
200	↓	86.2	79.3	20.7
N/A	N/A	N/A	N/A	N/A
↓	↓	↓	↓	↓

Finess Modules (FM) N/A (See ASTM C 136-83, Section 8.2)

MATERIALS FINER THAN NO. 200 SIEVE BY WASHING		Remarks
C = Percentage of material passing a 200 Sieve	N/A %	
D = Original Dry Weight of Sample	N/A g	WASHED GRADING
E = Dry Weight of Sample After Washing/Sieve	N/A g	
C = <(D-E)/D>*100		

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.
Checked By; RG ALEXANDER Date 10-15-91

A-6400-204(2-87)

9413224.0013

GRAIN SIZE ANALYSIS PLOT

Sample No. R. 0006

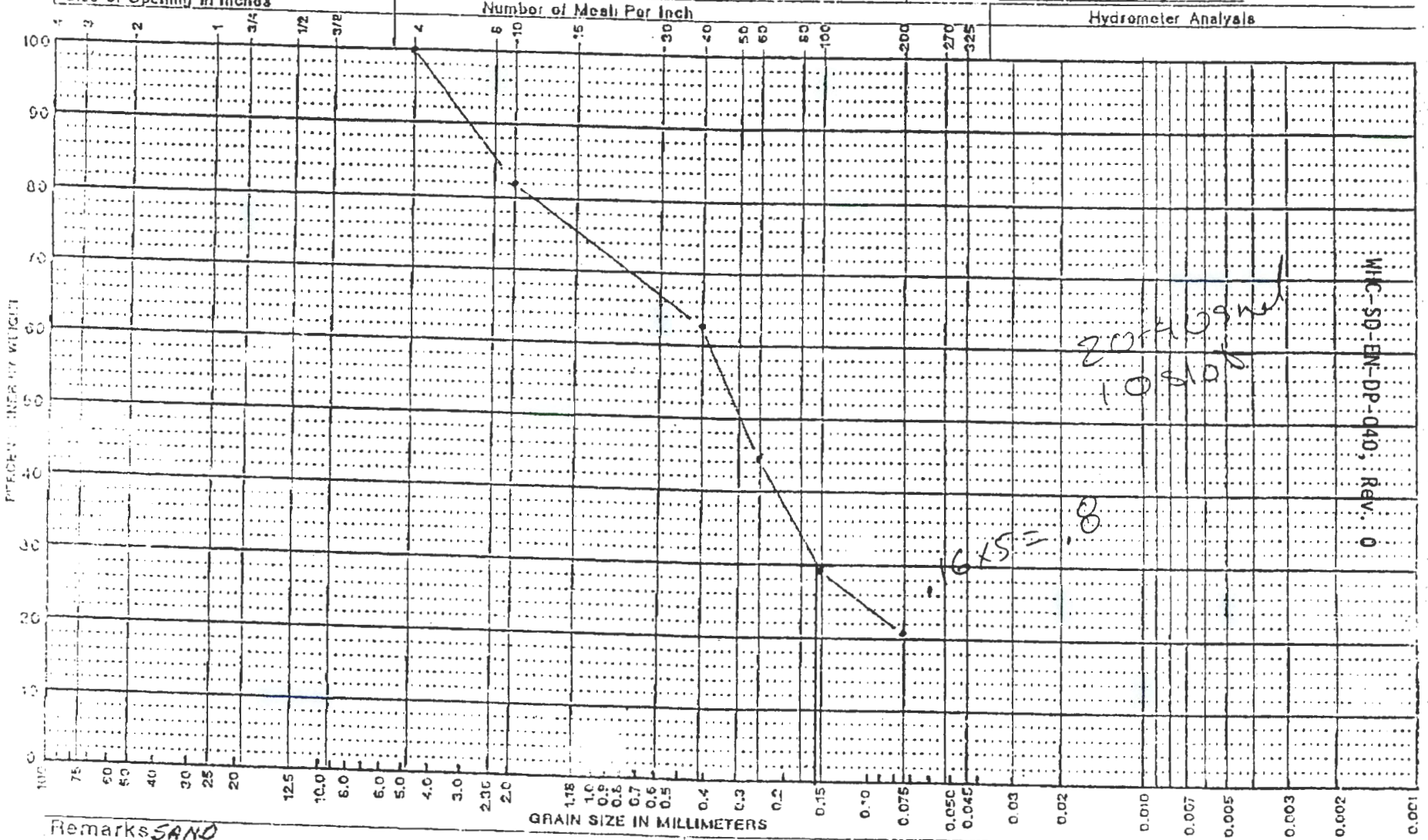
Page 1 of 1

Procedure No. GEL- 07 Rev. 1 Date Issued 11-15-89

Test Plan No. N/A Rev. N/A Date Issued N/A

Plotted By JERRY L. ENGLAND

Date 10-15-91



Remarks SAND

199-N-74

All data are accurately and completely recorded. The test operator was trained and used calibrated instruments.

Checked By: RG. ALEXANDER Date 10-15-91

WHC-SD-EN-DP-040, Rev. 0

APPENDIX C

WELL DEVELOPMENT AND PUMP INSTALLATION

This appendix includes for each well:

1) Well development log
2) Pump installation report.

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9413224.0115

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WELL 199-N-71

9413274.0116

3-7-10

WELL DEVELOPMENT FORM

Well Designation 199-N-71 Well Depth 88.42' BTOC

Screened Interval 88.42'-67.38' Date Well Development is Performed 11-5-91

BAILING

Water Level Prior to Bailing _____ Time of Measurement _____

Volume of Bailer _____ Number of Bails Removed _____ Gallons _____

Summary Description of Water Removed _____

Water Level After Bailing _____ Time of Measurement _____

SURGE BLOCK

Type of Surge Block _____ Dimension of Surge Block _____

TD BEFORE	STROKE LENGTH	STROKE FREQUENCY	SURGE INTERVAL	SURGE TIME	TD AFTER	TD DIFFERENCE

AIRLIFT

Depth of Eductor Pipe _____ Airlift Start Time _____

Flow Rate _____ Accumulated Flow _____ Airlift Stop Time _____

Turbidity _____, _____, _____, _____, _____, _____, _____, _____

_____, _____, _____, _____, _____, _____, _____, _____

MECHANICAL PUMPING

Pumping Technique Constant Discharge Pump Depth 87.2' BTOC Pump Start Time 1000/1420

Flow Rate 15 GPM Accumulated Flow 4400 gal Pump Stop Time 1350/1525

Turbidity 7100 NTU, 75 NTU, 32 NTU, 70 NTU, 57 NTU, 37 NTU, 28 NTU, 9.1 NTU

26 NTU, 11 NTU, 6.5 NTU, -, -, -, -, -

Comments _____

Signature of Recorder James A. Coates James A. Coates Date 11/20/91

Sign and Print Name

A-6000-393 (03/90)

9413224.0117

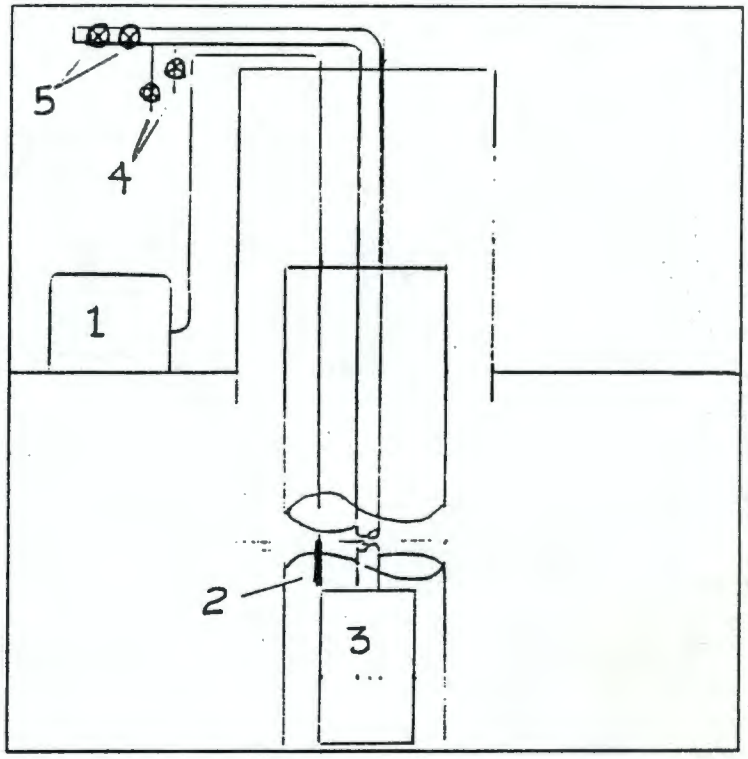
EQUIPMENT CONFIGURATION AND WELL HEAD DIAGRAM

Well Designation 199-N-71 Depth 88.42' BTOC

Equipment Configuration

Item	Description
1	HERMIT DATA LOG. SN-2K192
2	TRANSDUCER SN-26236
3	PUMP
4	SAMPLING PORTS
5	SHUT OFF VALVES

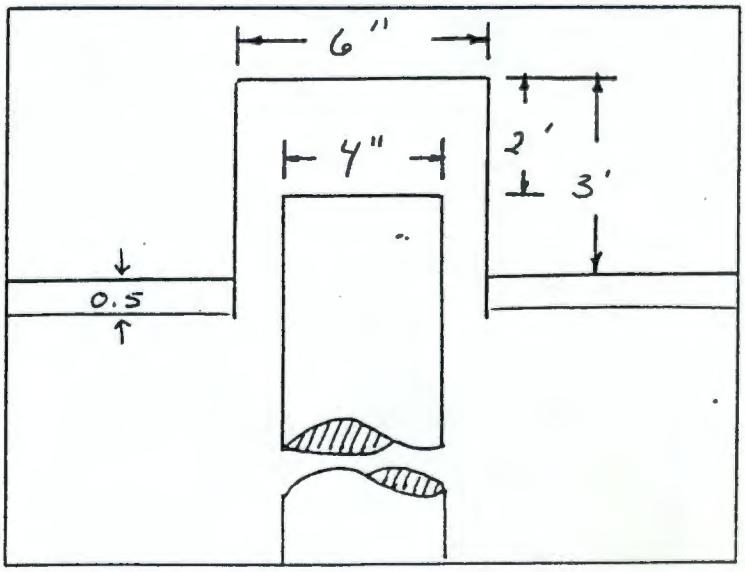
Diagram



Well Head

Comments

Diagram



Signature of Recorder James A. Coates JAMES A. COATES Date 11/22/91

A-6000-417 (08/89)

9413224.0118

WHC-SD-EN-DP-040, Rev. 0
SAMPLING PUMP INSTALLATION FORM

VALIDATED
ADR 2/19/92

Project: W017/100N

Well Number 199-N-71

Pump Type HYDROSTAR

Pump Model 8000

Date Installed: 11-5-91

Installed by: B. SPRODE / MANUSCRIPT KEH.

Depth to water: 71.71

Depth to Bottom 88.43

Reported Depth to water:

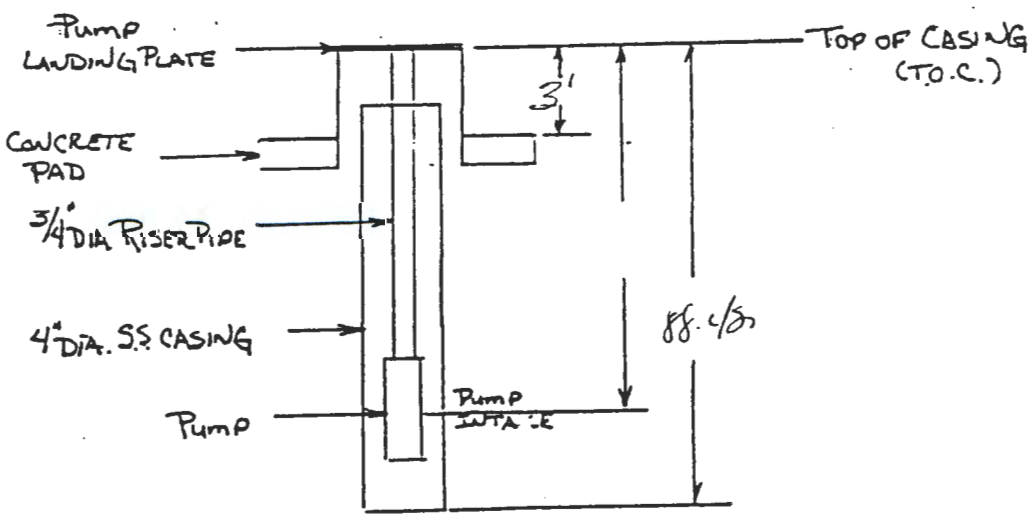
Screened Interval:

Pump/Riser Pipe Description:
pipe: 3/4" S.S.
pump length: 4.31
pump screen length 1.91
material cleaning: MANUFACTURER

Comments:

PUMP INSTALLATION SKETCH

Total material length 84.3'
Loc. of pump intake: 82.4 BTOC



Completed By: J. A. Coates

Date: 11/5/91

424

88.42
4.20
84.28
1.91
82.37

9413224.0120

WELL 199-N-72

WELL DEVELOPMENT FORM

Well Designation 199-N-72 Well Depth 88.33' BTOC

Screened Interval 88.33-67.30' Date Well Development is Performed 11-7-91/11-8-91

BAILING

Water Level Prior to Bailing _____ Time of Measurement _____

Volume of Bailer _____ Number of Bails Removed _____ Gallons _____

Summary Description of Water Removed _____

Water Level After Bailing _____ Time of Measurement _____

SURGE BLOCK

Type of Surge Block _____ Dimension of Surge Block _____

TD BEFORE	STROKE LENGTH	STROKE FREQUENCY	SURGE INTERVAL	SURGE TIME	TD AFTER	TD DIFFERENCE

AIRLIFT

Depth of Eductor Pipe _____ Airlift Start Time _____

Flow Rate _____ Accumulated Flow _____ Airlift Stop Time _____

Turbidity _____, _____, _____, _____, _____, _____, _____, _____

_____, _____, _____, _____, _____, _____, _____, _____

MECHANICAL PUMPING

Pumping Technique Constant Discharge Pump Depth 86.1' BTOC. Pump Start Time 0825 11-7-91

Flow Rate 12.2 GPM Accumulated Flow ~~[illegible]~~ 6325 GAL 11-8-91 Pump Stop Time 0845 11-7-91

Turbidity 73 NTU, 77 NTU, 48 NTU, 49 NTU, 32 NTU, 23 NTU, 20 NTU, 27 NTU

7.5 NTU, 9.5 NTU, 8.7 NTU, 9.7 NTU, 8.7 NTU, 6.7 NTU, 5.8 NTU, 5.0 NTU

Comments _____

Signature of Recorder James A. Coates James A. Coates Date 11/20/91

Sign and Print Name

A-6000-393 (03/90)

9413274.0121

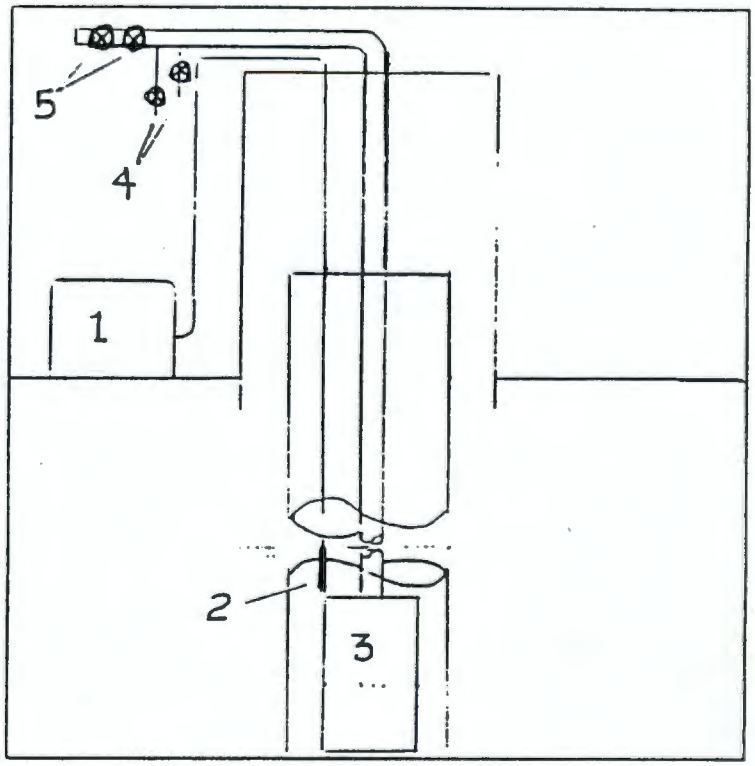
EQUIPMENT CONFIGURATION AND WELL HEAD DIAGRAM

Well Designation 199-N-72 Depth 88.33' BTOC

Equipment Configuration

Item	Description
1	HERMIT DATA LOG. SN-2K192
2	TRANSDUCER SN-262362
3	PUMP
4	SAMPLING PORTS
5	SHUT OFF VALVES

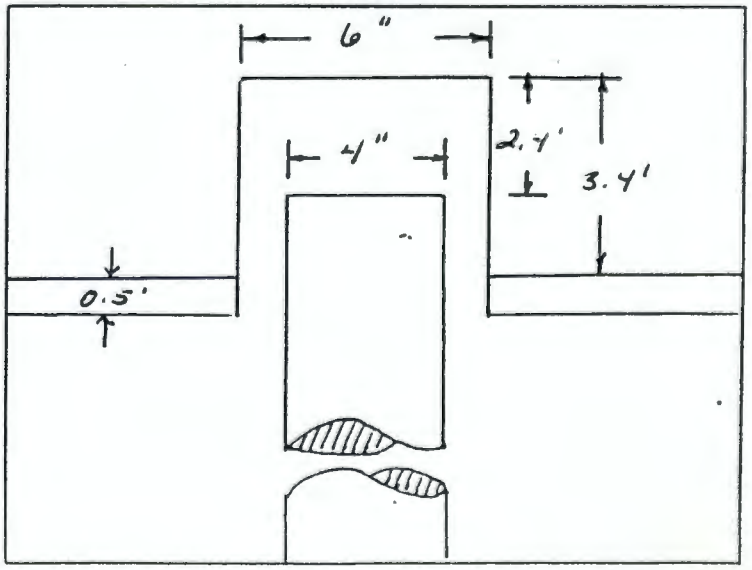
Diagram



Well Head

Comments

Diagram



Signature of Recorder James A. Coates JAMES A. COATES Date 11/20/92

A-6000-417 (08/89)

9413224.0122

SAMPLING PUMP INSTALLATION FORM

VALIDATED KDR 3/19/92 SIGNATURE DATE

Project: W017/100N

Well Number 199-N-72

Pump Type HYDROSTAR

Pump Model 8001

Date Installed: 11/8/91

Installed by: B. STRIDE / M. MUNSON

Depth to water: 68.01 BTOC

Depth to Bottom 88.33' BTOC

Reported Depth to water: _____

Screened Interval: ~~Gator~~ 88.33 - 67.30'

Pump/Riser Pipe Description:

pipe: 3/4" S.S.

pump length: 4.3'

pump screen length 1.9'

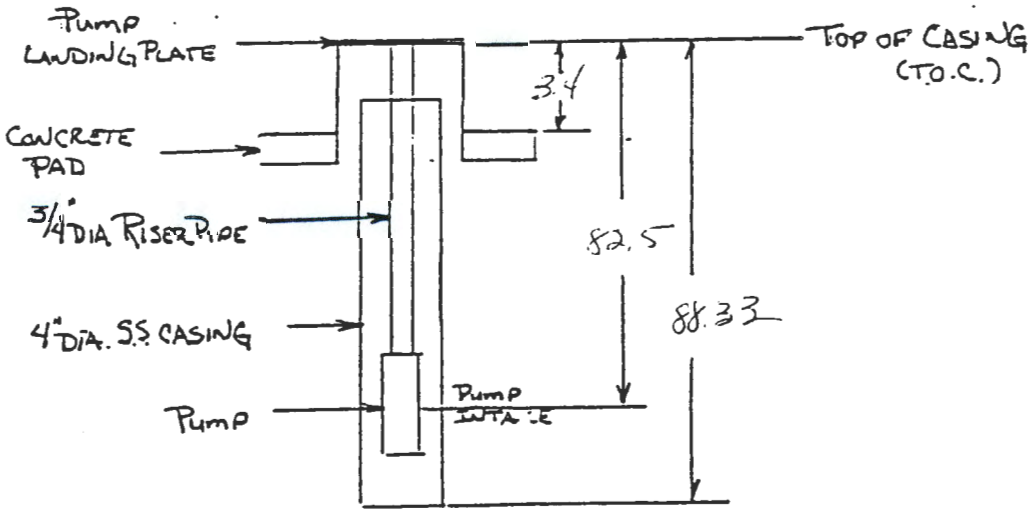
material cleaning: MANUFACTURES

Comments:

PUMP INSTALLATION SKETCH

Total material length 84.3

Loc. of pump intake: 82.5



Completed By: J. A. Coates

Date: 11/8/91

9413224.0124

WELL 199-N-73

WELL DEVELOPMENT FORM

Well Designation 199-N-73 Well Depth 91.09' BTOC

Screened Interval ~~90.09'~~ 91.09' - 70.35' Date Well Development is Performed 11/5/91

BAILING

Water Level Prior to Bailing _____ Time of Measurement _____

Volume of Bailer _____ Number of Bails Removed _____ Gallons _____

Summary Description of Water Removed _____

Water Level After Bailing _____ Time of Measurement _____

SURGE BLOCK

Type of Surge Block _____ Dimension of Surge Block _____

TD BEFORE	STROKE LENGTH	STROKE FREQUENCY	SURGE INTERVAL	SURGE TIME	TD AFTER	TD DIFFERENCE

AIRLIFT

Depth of Eductor Pipe _____ Airlift Start Time _____

Flow Rate _____ Accumulated Flow _____ Airlift Stop Time _____

Turbidity _____, _____, _____, _____, _____, _____, _____, _____

_____, _____, _____, _____, _____, _____, _____, _____

MECHANICAL PUMPING

Pumping Technique Constant Discharge Pump Depth ~~13.845 BWL~~ 89.89' BTOC Pump Start Time 1023/1040

Flow Rate 8.8 GPM Accumulated Flow 3282 GALS Pump Stop Time 1030/1653

Turbidity 56 NTU, 17 NTU, 8.5 NTU, 9.0 NTU, 6.1 NTU, 5.6 NTU, —, —

—, —, —, —, —, —, —, —

Comments _____

Signature of Recorder James A. Coates James A. Coates Date 11/18/91

Sign and Print Name

A-6000-393 (03/90)

9413224.0125

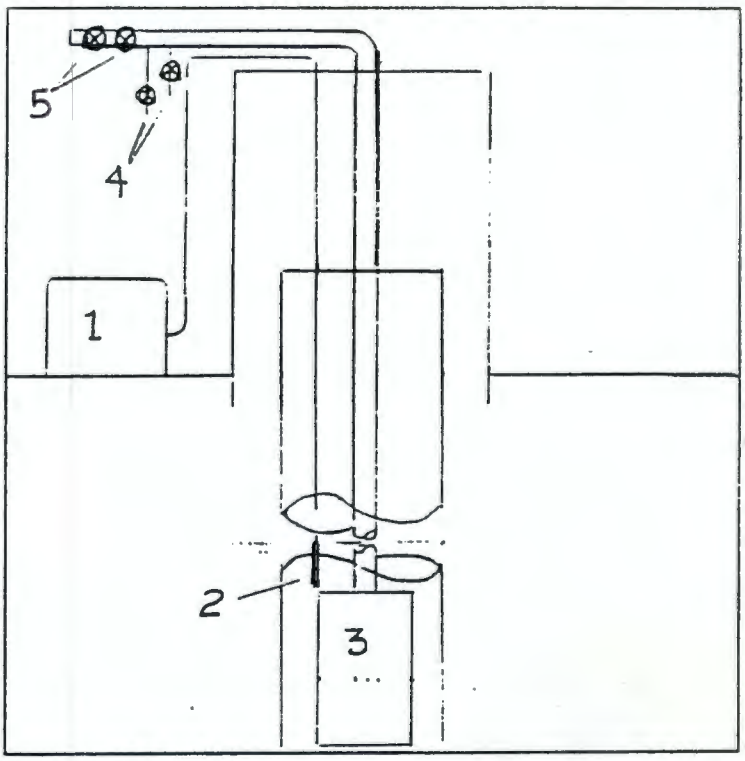
EQUIPMENT CONFIGURATION AND WELL HEAD DIAGRAM

Well Designation 199-N-73 Depth 91.09' BTOC

Equipment Configuration

Item	Description
1	HERMIT DATA LOG. SN-2[illegible]92
2	TRANSDUCER SN-262362
3	PUMP
4	SAMPLING PORTS
5	SHUT OFF VALVES

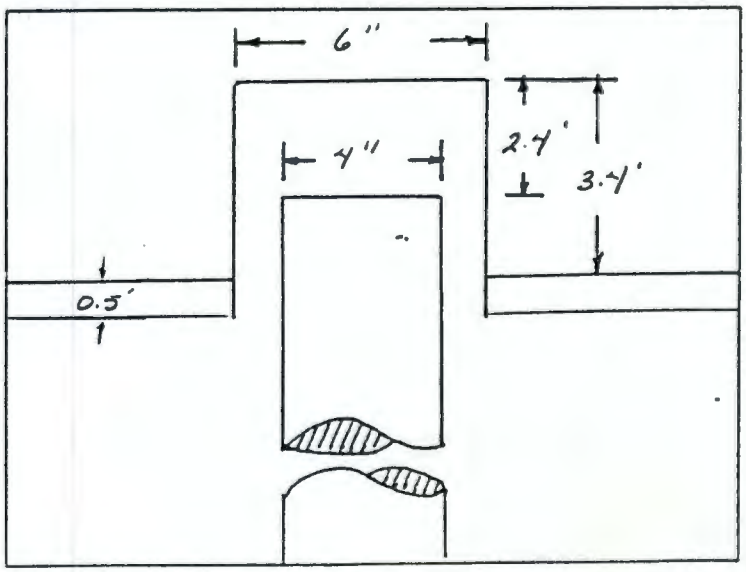
Diagram



Well Head

Comments

Diagram



Signature of Recorder James A. Coates JAMES A. COATES Date 11/18/91

A-6000-417 (08/89)

9413224.0126

WHC-SD-EN-DP-040, Rev. 0
SAMPLING PUMP INSTALLATION FORM

VALIDATED KDR 7/19/92

Project: W017/100W

Well Number 199-N-73

Pump Type HYDROSTAR

Pump Model 8001

Date Installed: 11/5/91

Installed by: B. STRODE, M. MUNSON

Depth to water: 73.13

Depth to Bottom 91.09

Reported Depth to water: –

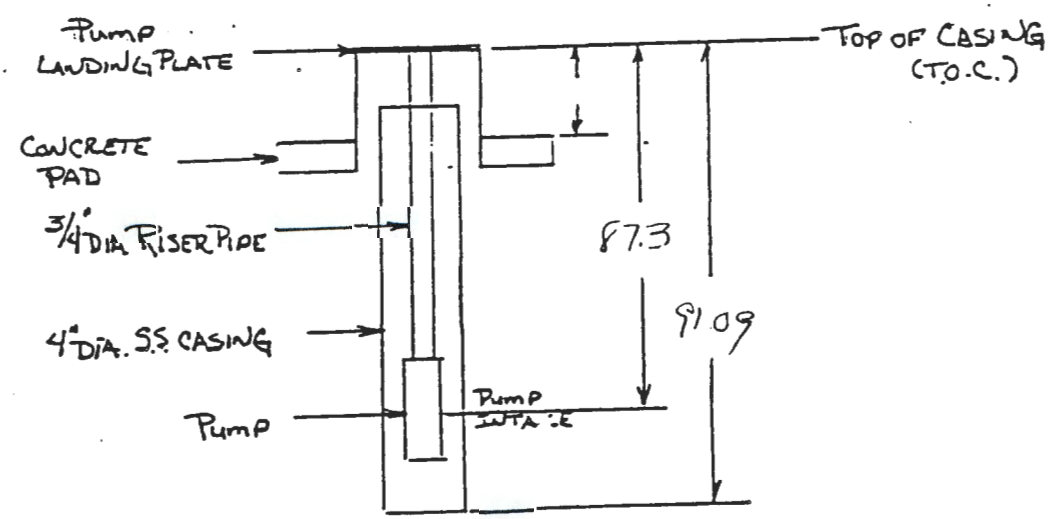
Screened Interval: (NOT IN WELL CONS. REPORT)

Pump/Riser Pipe Description:
pipe: 3/4" S.S.
pump length: 4.3
pump screen length 1.9
material cleaning: MANUFACTURE

Comments:

PUMP INSTALLATION SKETCH

Total material length
Loc. of pump intake: 87.3



Completed By: J.A. COATES

Date: 11/5/91

WELL 199-N-74

9413224.0128

~~399~~

WELL DEVELOPMENT FORM

Page 1 of 1

Well Designation 199-N-74 Well Depth 84.12' BTOC

Screened Interval 84.12' - 63.42' Date Well Development is Performed 11-4-91

BAILING

Water Level Prior to Bailing _____ Time of Measurement _____

Volume of Bailer _____ Number of Bails Removed _____ Gallons _____

Summary Description of Water Removed _____

Water Level After Bailing _____ Time of Measurement _____

SURGE BLOCK

Type of Surge Block _____ Dimension of Surge Block _____

TD BEFORE	STROKE LENGTH	STROKE FREQUENCY	SURGE INTERVAL	SURGE TIME	TD AFTER	TD DIFFERENCE

AIRLIFT

Depth of Eductor Pipe _____ Airlift Start Time _____

Flow Rate _____ Accumulated Flow _____ Airlift Stop Time _____

Turbidity _____, _____, _____, _____, _____, _____, _____, _____

_____, _____, _____, _____, _____, _____, _____, _____

MECHANICAL PUMPING

Pumping Technique Constant Discharge Pump Depth ~~12.521' BTOC~~ 83.0' BTOC Pump Start Time 1115

Flow Rate 12.4 GPM Accumulated Flow 310 gal Pump Stop Time 1140

Turbidity 4.3 NTU, 4.0 NTU, 3.2 NTU, –, –, –, –, –

–, –, –, –, –, –, –, –

Comments _____

Signature of Recorder ~~James A. Coates~~ James A. Coates Date 11/22/91

Sign and Print Name

A-6000-393 (03/90)

9413224.0129

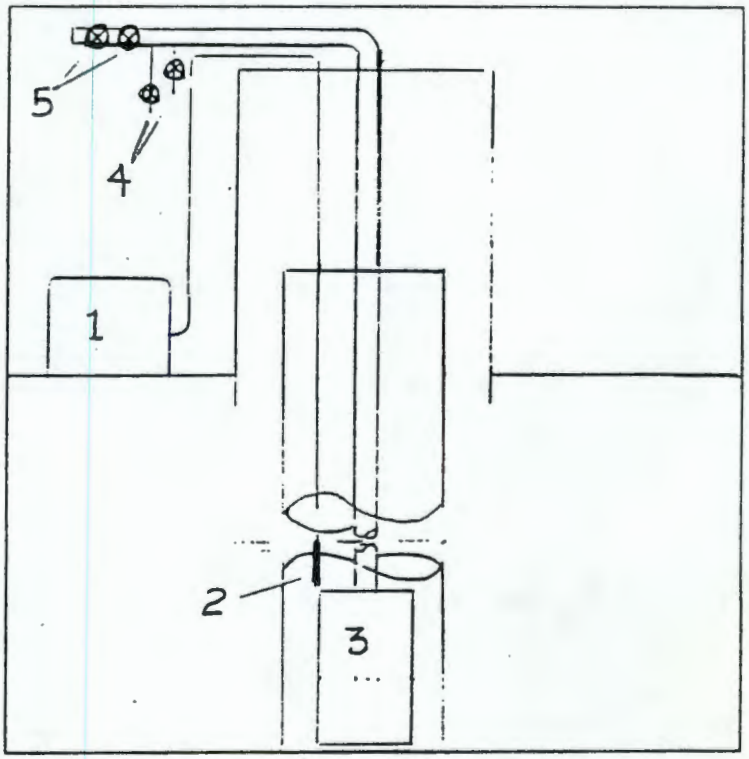
EQUIPMENT CONFIGURATION AND WELL HEAD DIAGRAM

Well Designation 199-N-74 Depth 84.12' BTOC

Equipment Configuration

Item	Description
1	HERMIT DATA LOG. SN-2K192
2	TRANSDUCER SN-262362
3	PUMP
4	SAMPLING PORTS
5	SHUT OFF VALVES

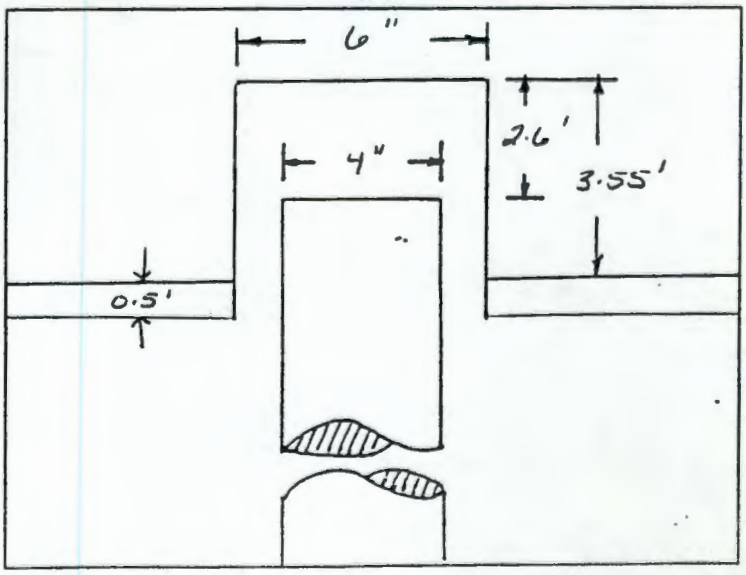
Diagram



Well Head

Comments

Diagram



Signature of Recorder James A. Coates JAMES A. COATES Date 11/22/91

A-6000-417 (08/89)

9413274.0130

WHC-SD-EN-DP-040, Rev. 0
SAMPLING PUMP INSTALLATION FORM

KDR 2/19/92

1 of 1

Project: W017/100N

Well Number 199-N-74

Pump Type HYDROSTAR

Pump Model 800 1

Date Installed: 10/4/91

Installed by: B STRADE/M. MUNSON

Depth to water: 66.41 TOC

Depth to Bottom 84.13 TOC

Reported Depth to water: _____

Screened Interval: _____

Pump/Riser Pipe Description:

pipe: _____

pump length: 4.3

pump screen length 1.9

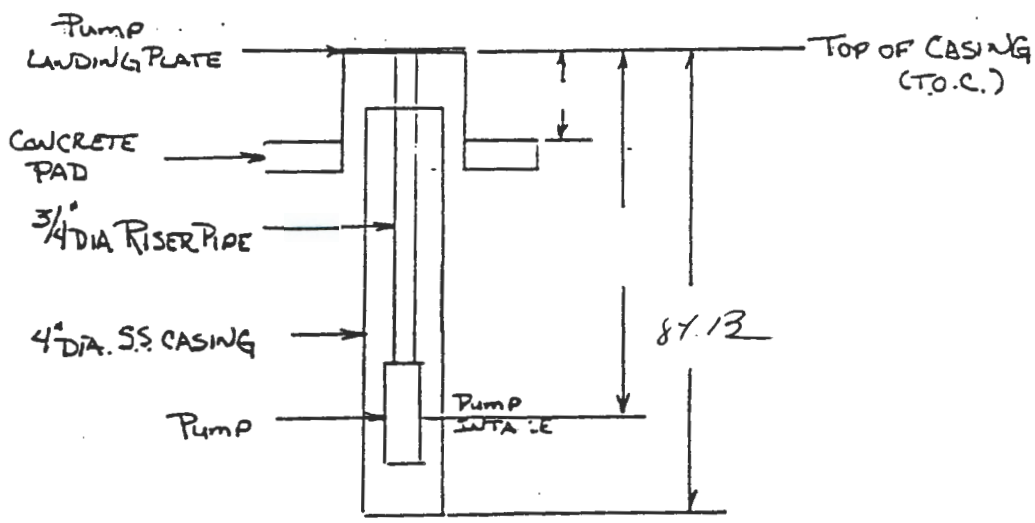
material cleaning: _____

Comments:

PUMP INSTALLATION SKETCH

Total material length _____

Loc. of pump intake: 77.1' BTOC



Completed By: J.A. Coates

Date: _____

APPENDIX D

AQUIFER TESTS

This appendix includes aquifer test data and interpretations for each well.

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9413224.0133

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D.0 INTRODUCTION

This appendix includes descriptions and interpretations of aquifer tests conducted in wells N-71 through N-74 in 1991. Data and interpretations are compiled by well. For each aquifer test there is an "Aquifer Test Summary" form. Raw data and data plots follow the summary form.

D.1 SUMMARY OF AQUIFER TEST RESULTS

Table D-1 presents results of aquifer tests in wells N-71, N-72, N-73, and N-74. Slug withdrawal data analyzed by the Bouwer (1989) method are believed to provide the most representative results. Values of T and K derived from various tests and methods are in reasonable agreement with one another. Based on the geologist's logs, it is reasonable that well N-74 exhibited the highest hydraulic conductivity. The formation at the screened depth was primarily gravel of the Hanford formation. The other wells are completed in the Ringold Formation. Table D-2 summarizes information on well construction and the lithologies of the screened intervals.

Other pumping tests have been conducted in the 100-N Area, as summarized by Hartman (1991). Those pumping tests had higher pumping rates than the recent tests; observation wells were employed where possible; the wells were pumped longer. Resulting estimates of transmissivity were 10 to 100 times greater than those estimated in the recent tests. Tested thicknesses (i.e., screened intervals) were approximately the same. The wells tested previously were at least several thousands of feet away from the recently-tested wells, so aquifer heterogeneity could be responsible for the difference in transmissivity. Also, the recent tests stressed smaller volumes of the aquifer than the earlier tests.

Table D-1. Summary of Aquifer Test Results for 1991.

Well		Cooper/Jacob		Bouwer/Rice		Cooper et al	
		Discharge	Recovery	Slug injection	Slug withdrawal	Slug injection	Slug withdrawal
N-71	T (ft^2/d)	204	102	(240)	(380)	--	320
	K (ft/d)	(12)	(6.1)	14	23	--	(19)
N-72	T (ft^2/d)	--	--	(400)	(430)	--	440
	K (ft/d)	--	--	19	21	--	(22)
N-73	T (ft^2/d)	--	--	(106)	(170)	--	--
	K (ft/d)	--	--	5.9	9.5	--	--
N-74	T (ft^2/d)	--	--	--	(1700)	--	--
	K (ft/d)	--	--	--	96	--	--

-- not determined

Values in parentheses were calculated according to the equation T=Kb, where b is the thickness of the screened interval below the water table.

Values determined by the Bouwer and Rice method for slug withdrawal are believed to be most representative of the aquifer in the vicinity of the boreholes

Table D-2. Summary of Geologic Logs and Construction Information for Screened Interval of 1991 Wells.

Well	Screened Interval		Depth of Hanford-Ringold Contact (ft bls)	Sand pack	Screen	Comments
	Depth bls	Lithology; Formation				
N-71	84.5 - 63.8	40-50% gravel. 40-60% of the sand is fine to very fine. Poorly to moderately sorted. Aquifer is in the Ringold Formation.	55	10-20 mesh	20-slot	Sampled with hard tool
N-72	82.3 - 61.2	85% gravel. 30-40% of the sand is fine to very fine. Poorly sorted. Aquifer is in the Ringold Formation.	65	10-20 mesh	20-slot	Sampled with drive barrel and hard tool
N-73	86.1 - 65.4	10-90% gravel. 35-60% of the sand is fine to very fine. Moderately to well-sorted. Aquifer is in the Ringold Formation.	60 - 70	10-20 mesh	20-slot	Sampled with split tube and hard tool
N-74	79.7 - 59	most of the interval is 95% gravel. Well-sorted; sand is coarse to very coarse. Aquifer is primarily Hanford formation.	77 - 80	20-40 mesh	10-slot	Sampled with hard tool

D.2 WELL DEVELOPMENT TESTS

D.2.1 Field Procedures

The wells were pumped after completion to develop the sand pack and reduce turbidity. The water level was measured with an electrical tape before development and a pressure transducer was calibrated to the measured level. In the data tables that follow the "Reference" value is measured depth to water in feet. The water level was monitored with a pressure transducer while the well was pumped and after the pump was shut off, until within 95% of its static level.

D.2.2 Data Analysis

Well development data were analyzed in the same manner as constant discharge tests. However, the purpose of pumping was to develop the wells, and the discharge rates were not always constant. The Cooper and Jacob (1946) method was used to analyze the data. Only data from well N-71 were able to be analyzed. Short pumping times and variable pumping rates prevented analysis of data for the other wells.

The Cooper and Jacob method can often be used successfully for single well tests in partially penetrating wells. It is assumed that the estimated transmissivity applies to the screened interval only. Drawdown is plotted on the (linear) vertical axis and time on the (logarithmic) horizontal axis.

Ideally, data should fall on a straight line. The change in drawdown over one log cycle is determined from the graph. Transmissivity is then calculated from the following equation:

$$T=\frac{2.3Q}{4\pi\Delta s}$$

where T = transmissivity, Q = pumping rate, and Δs = change in water level over one log cycle.

Recovery data were analyzed by the Cooper and Jacob method in much the same way as drawdown data. The factor $(t_p+t_r)/t_r$ was plotted on the log scale instead of time, where t_p = pumping time, and t_r = recovery time.

D.2.3 Assumptions and Limitations

The Cooper and Jacob method is applicable only when the parameter u is very small, i.e.:

$$u=\frac{r^2S}{4Tt}\leq 0.01$$

The u assumption generally is met at early times for pumping wells; the u value is noted on the data plots that follow. For the following analyses, S = 0.1 was assumed as representative for an unconfined aquifer.

Factors influencing drawdown include: a) changing aquifer thickness as the water table declines; b) delayed yield; and c) borehole storage effects. Measured drawdown can be corrected for changing aquifer thickness with the following equation:

$$s'=s-\frac{s^2}{2b}$$

where s' = corrected drawdown; s = measured drawdown; b = aquifer thickness (assumed to be 40 ft for the 100-N tests). Drawdown was approximately 15% of the aquifer thickness at well N-71, so this correction was applied.

Weeks (1977) suggests the following equation to estimate the time at which borehole storage effects end:

$$t_c=\frac{25r^2}{0.04T}$$

where r = casing radius. This time is noted on the data plots that follow.

The 100-N development tests were of relatively short duration. The effects of delayed yield were probably significant throughout the tests, since none was run for an extended time. Neglecting delayed yield would result in an overestimate of transmissivity.

Pumping rates were not monitored continuously during development of wells N-71 through N-74. Water level data suggest that pumping rates changed significantly in at least some of the tests.

D.3 SLUG INJECTION AND SLUG WITHDRAWAL TESTS

Slug tests can often provide an estimate of aquifer properties in the immediate vicinity of a borehole. Slug injection and withdrawal were performed on the 100-N wells after completion and development.

D.3.1 Field Procedures

The water level was measured with an electrical tape before the test and a pressure transducer was calibrated to the measured level. A solid slugging rod was suddenly submerged in the water column of the well. The water level was measured with a pressure transducer until it had returned to nearly static. The slugging rod was then withdrawn from the water column, and water level monitored again until it returned to static.

D.3.2 Data Analysis

Two methods of analysis were attempted: Cooper et al. (1967), and Bouwer and Rice (as modified by Bouwer, 1989). The Cooper method accounts for borehole and aquifer storage; the Bouwer and Rice method treats the well as having an infinitesimally small diameter.

The Cooper method was applied to the 100-N slug tests, but data were often not matchable to the type curves. The method is primarily designed for confined aquifers. It involves plotting log time on the horizontal axis and the change in head divided by initial change in head on the vertical axis. For the 100-N tests, the initial change in head was assumed to be 1.5 ft, which is the theoretical displacement in a 4-in-diameter well from a slug volume of 0.13 ft^3. This value was used because the measured change in head oscillated at early time.

The Bouwer and Rice method is designed for fully- or partially-penetrating wells in unconfined aquifers. Time is plotted on the horizontal axis and the log of depth to water (or log of change in water level) on the vertical axis. The updated method (Bouwer 1989) also accounts for the sand pack around the screen, which effectively increases the diameter of the screened interval. Definitions are illustrated in Figure D-1.

The 100-N slug test data were plotted by hand, and a best-fit line was chosen visually. A computer program was used to perform Bouwer and Rice calculations. The program requires inputting the y-intercept of the line, and the head at some time t; it uses these data to calculate the slope of the

line. It also calculates an effective casing radius and other parameters required by the Bouwer and Rice method.

It is sometimes possible to estimate the conductivity of the sand pack using the Bouwer and Rice method. In some of the 100-N slug withdrawal tests, early time data (representative of the sand pack) have a steeper slope on a semilog plot than later data (representative of the formation). A steeper slope corresponds to a higher hydraulic conductivity.

D.3.3 Assumptions and Limitations

Slug tests stress a relatively small portion of the aquifer immediately around the borehole. Results may not be representative of the entire aquifer.

Slug withdrawal data are generally more representative of aquifer properties than are injection data when injection wets a previously unsaturated portion of the formation. This was the case in the 100-N slug tests.

Measured water levels at the start of some of the slug injection tests were greater than expected (1.5 ft). In all cases, slug injection caused oscillations in water level. These very early data were not used in analyzing the data.

Other input parameters to the Bouwer and Rice methods are porosity of the sand pack and aquifer thickness. Neither of these parameters is known accurately for the 100-N wells, so they were estimated. These parameters were varied for well N-74 to assess the sensitivity of the analysis to these values. A 33% change in sand pack porosity resulted in a 16% change in the calculated hydraulic conductivity. A 25% change in aquifer thickness resulted in less than 1% difference in estimated hydraulic conductivity. Slug tests provide rather rough estimates of aquifer properties; the error introduced because of uncertainties in aquifer thickness and sand pack porosity is probably insignificant in comparison.

D.4 REFERENCES

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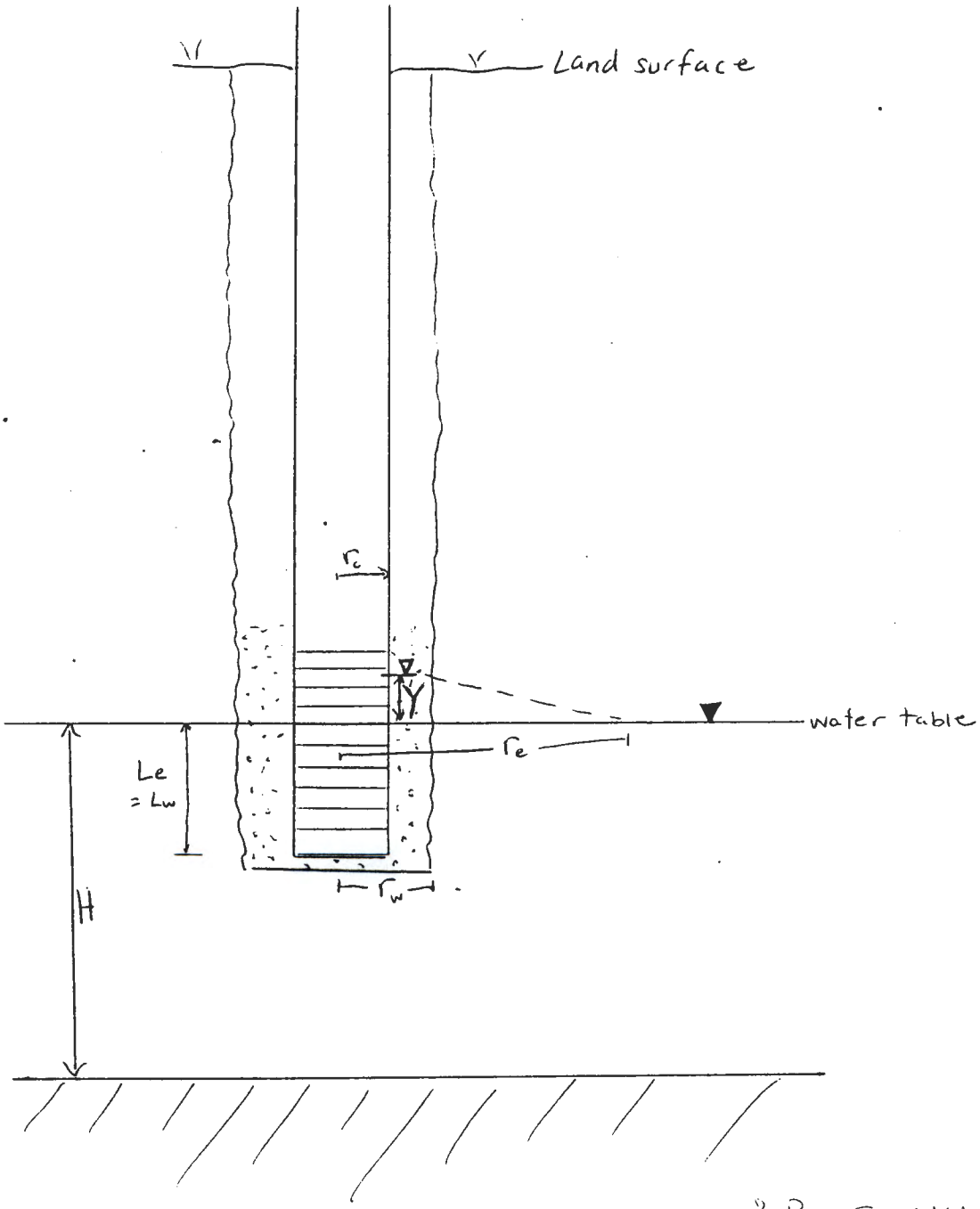

FIG. D-1: DEFINITION OF TERMS FOR BOUWER & RICE ANALYSES

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WELL 199-N-71

9413224.0142

AQUIFER TEST SUMMARY

WELL 199-N-71 DEVELOPMENT AND RECOVERY

Purpose of Tests: The well was pumped for development. Water levels were measured during drawdown and recovery for use in estimating aquifer transmissivity.

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 88.42 to 67.38 ft below top of casing; Water level at 71.71 ft below top of casing; tested thickness = 16.71 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in. (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 5 Nov 91 Start Time of Test: 10:01

Pumping Rate: Average discharge = 15 gal/min (2,900 ft^3/d)

Duration of Test: Discharge: 230 min (3.8 h); Recovery monitored for 22 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 7.06 ft

RESULTS: (Data analyzed by Cooper and Jacob method)

Methods	Transmissivity (ft^2/d)	Hydraulic Conductivity (ft/d)*	Storativity
Drawdown data	204	12	Not determined
Recovery data	102	6.1	Not determined

* Hydraulic conductivity estimated by dividing transmissivity by the screened aquifer thickness.

Remarks:

The water level was highly variable during first 0.5 min of pumping during development. Fluctuations in water level were measured after 35 min of pumping; this is believed to be due to changing pumping rate. Drainage of the aquifer probably influenced the change in water levels throughout the test.

The graph of drawdown vs. log time appears to have two straight line portions. Transmissivity of the early time data ($t < 6$ min) was 140 ft^2/d. However, borehole storage effects were probably dominant during this time ($t_c = 7.2$ min). Transmissivity calculated from the later data (7 to 35 min) is 230 ft^2/d, with $t_c = 4.4$ min.

The u assumption was satisfied at a time of 0.44 min, assuming the storage coefficient is 0.1.

Recovery data were also analyzed. T was estimated at 97 ft^2/d. The difference of a factor of 2 between drawdown and recovery data is not unexpected, given the limitations of the test.

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WELL 199-N-71

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AQUIFER TEST SUMMARY

WELL 199-N-71 SLUG INJECTION AND WITHDRAWAL

Purpose of Tests: To estimate aquifer transmissivity or hydraulic conductivity

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 88.42 to 67.38 ft below top of casing; Water level at 71.71 ft below top of casing; tested thickness = 16.71 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 5 Nov 91 Start Time of Test: 15:58

Slugging Rod Dimension: 2-in-diameter by 6-ft length (0.13 ft^3)

Duration of Test: Injection: 10 min; Withdrawal: 9.5 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 1.79 ft

RESULTS:

Methods	Transmissivity (ft^2/d)*	Hydraulic Conductivity (ft/d)*	Storativity
Bouwer & Rice: Injection	240	14	Not determined
Bouwer & Rice: Withdrawal	380	23	Not determined
Cooper et al.: Withdrawal	320	19	Not determined

* Bouwer and Rice method estimates hydraulic conductivity; Cooper et al. estimates transmissivity. The other property was estimated by the equation T=Kb, where b = screened aquifer thickness.

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Remarks:

Water levels recovered rapidly (less than 1.5 min) after slug injection and withdrawal. Very early data after slug injection oscillated significantly and were not analyzed.

Bouwer and Rice analysis: Withdrawal data appear to illustrate a change in slope at around 0.2 min. The first data are believed to be indicative of the more permeable sand pack. Sand pack conductivity was calculated to be 70 ft/d.

Cooper et al. analysis: Injection data could not be matched to a type curve. Withdrawal data matched best to the "line source approximation" on the Cooper type cures; however, the fit was poor.

DRAWDOWN/RECOVERY

Well Designation 199-N-71 Date 11-5-91

Well Depth 88.42' BTOC Screened Interval 88.42' - 67.38'

Pumping Method CONSTANT DISCHARGE

Equipment Used to Measure Water Level E.TAPE/TRANSDUCER S.N ET-5/26236 Calibration Due 1-24-92/5-9-92

Equipment Used to Measure Flow —NA— S.N. —NA— Calibration Due —NA—

Measuring Point TOP OF CASING 6" (T.O.C. 6") Pump Start Time 1000 1420 Pump Stop Time 1350 1525

Time		Water Level		Discharge
Date	Time	Reading Unit:	Water Level Unit:	Reading Unit:
				BUCKET METHOD.
				5gal/20 sec = 15 GPM
		SEE		
		ATTACHED		

Signature of Recorder JAMES A. COATES JAMES A. COATES Date 11/22/91

Sign and Print Name

A-6000-402 (03/90)

9112224.0149

WELL N-71 DEVELOPMENT

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Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0.5000	0.0083	72.117	-72.117	-0.278	-0.279
0.5833	0.0097	72.013	-72.013	-0.382	-0.384
0.6666	0.0111	72.496	-72.496	0.101	0.101
0.7500	0.0125	73.064	-73.064	0.669	0.663
0.8333	0.0139	73.329	-73.329	0.934	0.923
0.9166	0.0153	73.509	-73.509	1.114	1.098
1.0000	0.0167	73.658	-73.658	1.263	1.243
1.0833	0.0181	73.787	-73.787	1.392	1.368
1.1666	0.0194	73.904	-73.904	1.509	1.481
1.2500	0.0208	74.018	-74.018	1.623	1.590
1.3333	0.0222	74.116	-74.116	1.721	1.684
1.4166	0.0236	74.214	-74.214	1.819	1.778
1.5000	0.0250	74.305	-74.305	1.910	1.864
1.5833	0.0264	74.381	-74.381	1.986	1.937
1.6666	0.0278	74.466	-74.466	2.071	2.017
1.7500	0.0292	74.542	-74.542	2.147	2.089
1.8333	0.0306	74.618	-74.618	2.223	2.161
1.9166	0.0319	74.694	-74.694	2.299	2.233
2.0000	0.0333	74.772	-74.772	2.377	2.306
2.5000	0.0417	75.173	-75.173	2.778	2.682
3.0000	0.0500	75.505	-75.505	3.110	2.989
3.5000	0.0583	75.767	-75.767	3.372	3.230
4.0000	0.0667	75.988	-75.988	3.593	3.432
4.5000	0.0750	76.159	-76.159	3.764	3.587
5.0000	0.0833	76.310	-76.310	3.915	3.723
5.5000	0.0917	76.456	-76.456	4.061	3.855
6.0000	0.1000	76.576	-76.576	4.181	3.962
6.5000	0.1083	76.680	-76.680	4.285	4.055
7.0000	0.1167	76.771	-76.771	4.376	4.137
7.5000	0.1250	76.853	-76.853	4.458	4.210
8.0000	0.1333	76.926	-76.926	4.531	4.274
8.5000	0.1417	77.005	-77.005	4.610	4.344
9.0000	0.1500	77.068	-77.068	4.673	4.400
9.5000	0.1583	77.115	-77.115	4.720	4.442
10.0000	0.1667	77.172	-77.172	4.777	4.492
12.0000	0.2000	77.355	-77.355	4.960	4.652
14.0000	0.2333	77.535	-77.535	5.140	4.810
16.0000	0.2667	77.684	-77.684	5.289	4.939
18.0000	0.3000	77.794	-77.794	5.399	5.035
20.0000	0.3333	77.876	-77.876	5.481	5.105
22.0000	0.3667	77.940	-77.940	5.545	5.161
24.0000	0.4000	78.009	-78.009	5.614	5.220
26.0000	0.4333	78.075	-78.075	5.680	5.277
28.0000	0.4667	78.129	-78.129	5.734	5.323
30.0000	0.5000	78.195	-78.195	5.800	5.379
32.0000	0.5333	78.230	-78.230	5.835	5.409
34.0000	0.5667	78.306	-78.306	5.911	5.474

WELL N-71 DEVELOPMENT

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Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
36.0000	0.6000	78.350	-78.350	5.955	5.512
38.0000	0.6333	78.347	-78.347	5.952	5.509
40.0000	0.6667	78.379	-78.379	5.984	5.536
42.0000	0.7000	78.420	-78.420	6.025	5.571
44.0000	0.7333	78.426	-78.426	6.031	5.576
46.0000	0.7667	78.445	-78.445	6.050	5.592
48.0000	0.8000	78.461	-78.461	6.066	5.606
50.0000	0.8333	78.470	-78.470	6.075	5.614
52.0000	0.8667	78.451	-78.451	6.056	5.598
54.0000	0.9000	78.451	-78.451	6.056	5.598
56.0000	0.9333	78.495	-78.495	6.100	5.635
58.0000	0.9667	78.521	-78.521	6.126	5.657
60.0000	1.0000	78.514	-78.514	6.119	5.651
62.0000	1.0333	78.372	-78.372	5.977	5.530
64.0000	1.0667	78.344	-78.344	5.949	5.507
66.0000	1.1000	78.356	-78.356	5.961	5.517
68.0000	1.1333	78.353	-78.353	5.958	5.514
70.0000	1.1667	78.385	-78.385	5.990	5.541
72.0000	1.2000	78.426	-78.426	6.031	5.576
74.0000	1.2333	78.404	-78.404	6.009	5.558
76.0000	1.2667	78.429	-78.429	6.034	5.579
78.0000	1.3000	78.401	-78.401	6.006	5.555
80.0000	1.3333	78.356	-78.356	5.961	5.517
82.0000	1.3667	78.366	-78.366	5.971	5.525
84.0000	1.4000	78.404	-78.404	6.009	5.558
86.0000	1.4333	78.511	-78.511	6.116	5.648
88.0000	1.4667	78.524	-78.524	6.129	5.659
90.0000	1.5000	78.540	-78.540	6.145	5.673
92.0000	1.5333	78.530	-78.530	6.135	5.665
94.0000	1.5667	78.574	-78.574	6.179	5.702
96.0000	1.6000	78.587	-78.587	6.192	5.713
98.0000	1.6333	78.600	-78.600	6.205	5.724
100.0000	1.6667	78.600	-78.600	6.205	5.724
105.0000	1.7500	78.619	-78.619	6.224	5.740
110.0000	1.8333	78.653	-78.653	6.258	5.768
115.0000	1.9167	78.669	-78.669	6.274	5.782
120.0000	2.0000	78.713	-78.713	6.318	5.819
125.0000	2.0833	78.701	-78.701	6.306	5.809
130.0000	2.1667	78.830	-78.830	6.435	5.917
135.0000	2.2500	78.852	-78.852	6.457	5.936
140.0000	2.3333	78.830	-78.830	6.435	5.917
145.0000	2.4167	78.852	-78.852	6.457	5.936
150.0000	2.5000	78.915	-78.915	6.520	5.989
155.0000	2.5833	78.944	-78.944	6.549	6.013
160.0000	2.6667	78.849	-78.849	6.454	5.933
165.0000	2.7500	78.912	-78.912	6.517	5.986
170.0000	2.8333	78.969	-78.969	6.574	6.034

WELL N-71 DEVELOPMENT

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Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
175.0000	2.9167	78.969	-78.969	6.574	6.034
180.0000	3.0000	78.972	-78.972	6.577	6.036
185.0000	3.0833	79.016	-79.016	6.621	6.073
190.0000	3.1667	79.032	-79.032	6.637	6.086
195.0000	3.2500	79.124	-79.124	6.729	6.163
200.0000	3.3333	79.222	-79.222	6.827	6.244
205.0000	3.4167	79.272	-79.272	6.877	6.286
210.0000	3.5000	79.301	-79.301	6.906	6.310
215.0000	3.5833	79.323	-79.323	6.928	6.328
220.0000	3.6667	79.386	-79.386	6.991	6.380
225.0000	3.7500	79.392	-79.392	6.997	6.385
230.0000	3.8333	79.455	-79.455	7.060	6.437

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WELL N-71 RECOVERY

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SE2000
Environmental Logger
11/06 07:48

Unit# 192 Test 2

INPUT 1: Level (F) TOC

Reference	71.710
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

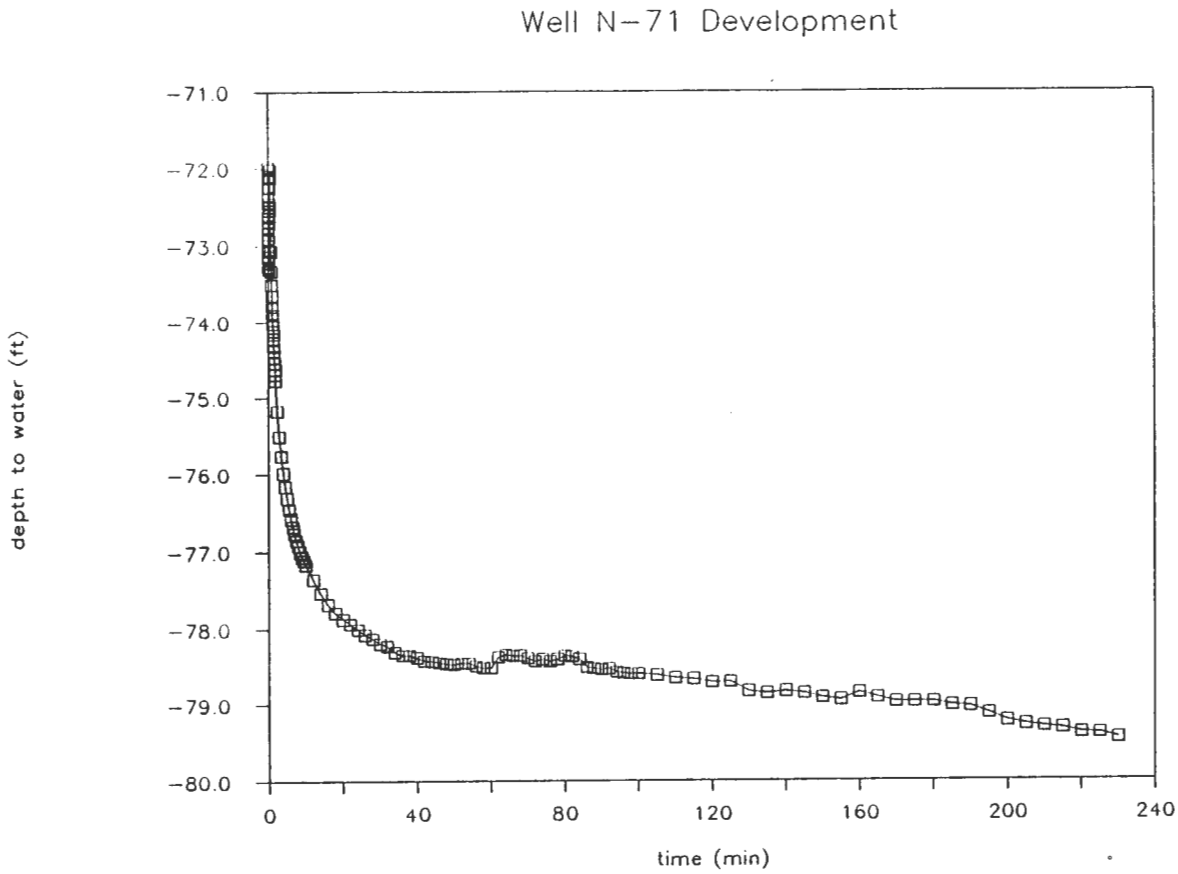
Step 0 11/05 13:52:57 tp = 230 min

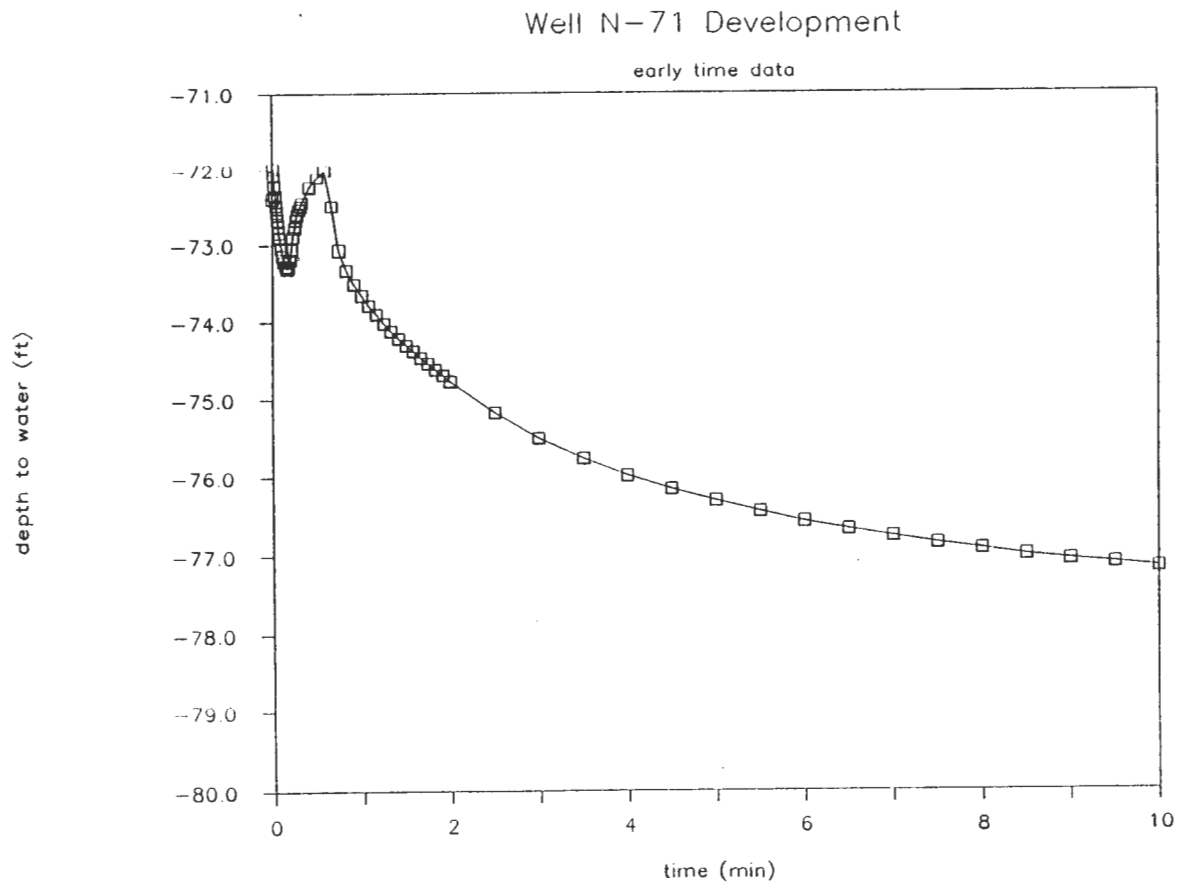
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.0000	0.0000	79.301	-79.301	7.591	6.871	
0.0083	0.0001	79.168	-79.168	7.458	6.763	27712
0.0166	0.0003	78.966	-78.966	7.256	6.598	13856
0.0250	0.0004	78.808	-78.808	7.098	6.468	9201
0.0333	0.0006	78.647	-78.647	6.937	6.335	6908
0.0416	0.0007	78.499	-78.499	6.789	6.213	5530
0.0500	0.0008	78.328	-78.328	6.618	6.071	4601
0.0583	0.0010	78.208	-78.208	6.498	5.970	3946
0.0666	0.0011	78.047	-78.047	6.337	5.835	3454
0.0750	0.0013	77.936	-77.936	6.226	5.741	3068
0.0833	0.0014	77.766	-77.766	6.056	5.598	2762
0.1000	0.0017	77.529	-77.529	5.819	5.396	2301
0.1166	0.0019	77.299	-77.299	5.589	5.199	1974
0.1333	0.0022	77.093	-77.093	5.383	5.021	1726
0.1500	0.0025	76.888	-76.888	5.178	4.843	1534
0.1666	0.0028	76.702	-76.702	4.992	4.680	1382
0.1833	0.0031	76.516	-76.516	4.806	4.517	1256
0.2000	0.0033	76.342	-76.342	4.632	4.364	1151
0.2166	0.0036	76.174	-76.174	4.464	4.215	1063
0.2333	0.0039	76.013	-76.013	4.303	4.072	987
0.2500	0.0042	75.849	-75.849	4.139	3.925	921
0.2666	0.0044	75.698	-75.698	3.988	3.789	864
0.2833	0.0047	75.552	-75.552	3.842	3.657	813
0.3000	0.0050	75.410	-75.410	3.700	3.529	768
0.3166	0.0053	75.281	-75.281	3.571	3.412	727
0.3333	0.0056	75.151	-75.151	3.441	3.293	691
0.4166	0.0069	74.652	-74.652	2.942	2.834	553

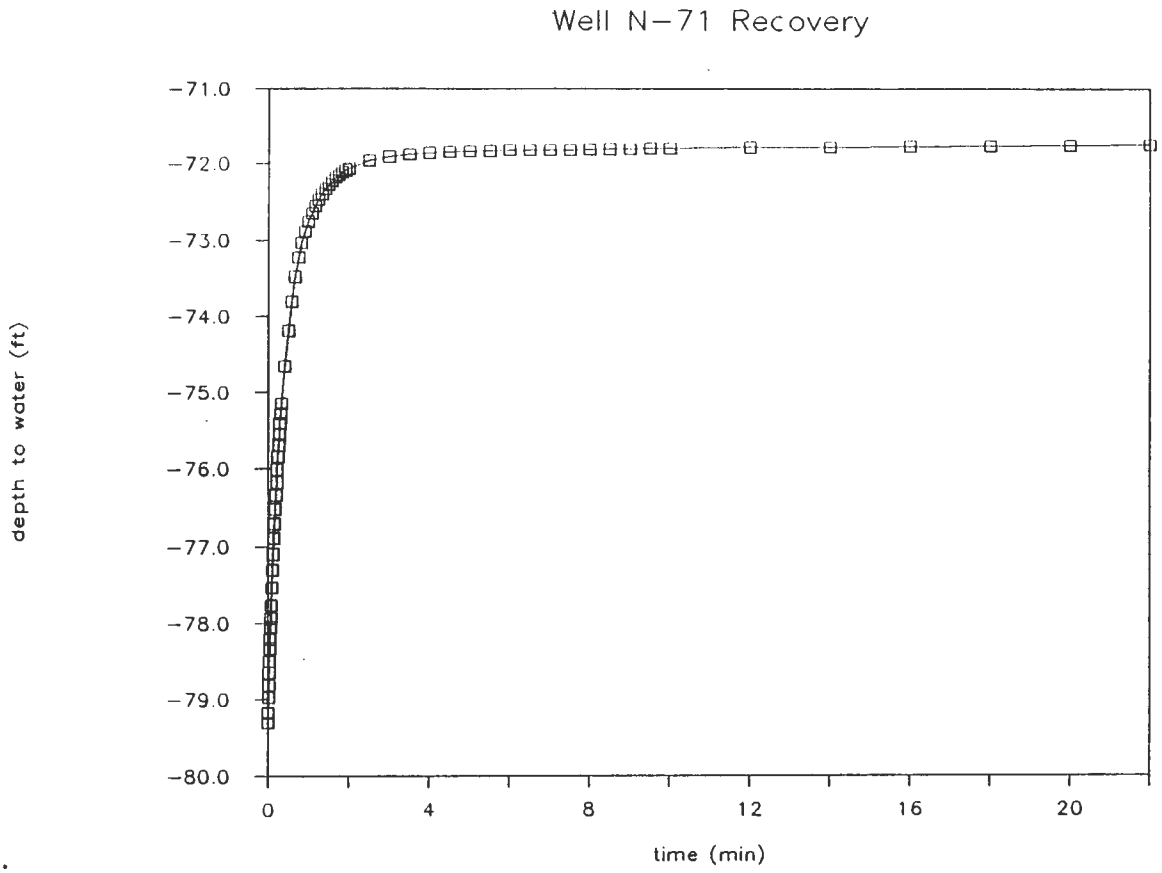
WELL N-71 RECOVERY

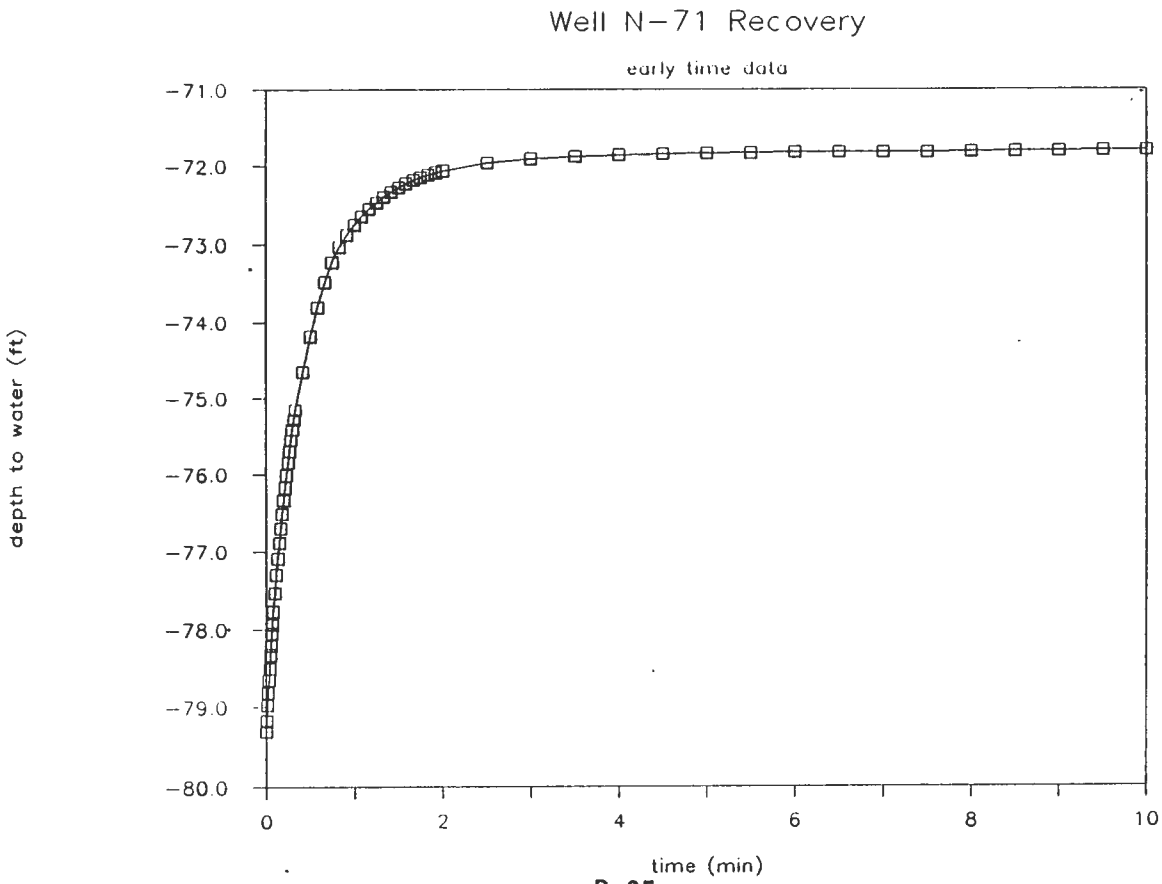
p. 8 of 8

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.5000	0.0083	74.185	-74.185	2.475	2.398	461
0.5833	0.0097	73.803	-73.803	2.093	2.038	395
0.6666	0.0111	73.481	-73.481	1.771	1.732	346
0.7500	0.0125	73.225	-73.225	1.515	1.486	308
0.8333	0.0139	73.029	-73.029	1.319	1.297	277
0.9166	0.0153	72.872	-72.872	1.162	1.145	252
1.0000	0.0167	72.748	-72.748	1.038	1.025	231
1.0833	0.0181	72.644	-72.644	0.934	0.923	213
1.1666	0.0194	72.546	-72.546	0.836	0.827	198
1.2500	0.0208	72.464	-72.464	0.754	0.747	185
1.3333	0.0222	72.392	-72.392	0.682	0.676	174
1.4166	0.0236	72.328	-72.328	0.618	0.613	163
1.5000	0.0250	72.268	-72.268	0.558	0.554	154
1.5833	0.0264	72.218	-72.218	0.508	0.505	146
1.6666	0.0278	72.174	-72.174	0.464	0.461	139
1.7500	0.0292	72.139	-72.139	0.429	0.427	132
1.8333	0.0306	72.111	-72.111	0.401	0.399	126
1.9166	0.0319	72.082	-72.082	0.372	0.370	121
2.0000	0.0333	72.057	-72.057	0.347	0.345	116
2.5000	0.0417	71.959	-71.959	0.249	0.248	93
3.0000	0.0500	71.905	-71.905	0.195	0.195	78
3.5000	0.0583	71.877	-71.877	0.167	0.167	67
4.0000	0.0667	71.858	-71.858	0.148	0.148	59
4.5000	0.0750	71.845	-71.845	0.135	0.135	52
5.0000	0.0833	71.836	-71.836	0.126	0.126	47
5.5000	0.0917	71.829	-71.829	0.119	0.119	43
6.0000	0.1000	71.823	-71.823	0.113	0.113	39
6.5000	0.1083	71.820	-71.820	0.110	0.110	36
7.0000	0.1167	71.817	-71.817	0.107	0.107	34
7.5000	0.1250	71.814	-71.814	0.104	0.104	32
8.0000	0.1333	71.811	-71.811	0.101	0.101	30
8.5000	0.1417	71.807	-71.807	0.097	0.097	28
9.0000	0.1500	71.801	-71.801	0.091	0.091	27
9.5000	0.1583	71.798	-71.798	0.088	0.088	25
10.0000	0.1667	71.795	-71.795	0.085	0.085	24
12.0000	0.2000	71.782	-71.782	0.072	0.072	20
14.0000	0.2333	71.779	-71.779	0.069	0.069	17
16.0000	0.2667	71.769	-71.769	0.059	0.059	15
18.0000	0.3000	71.763	-71.763	0.053	0.053	14
20.0000	0.3333	71.754	-71.754	0.044	0.044	13
22.0000	0.3667	71.747	-71.747	0.037	0.037	11


Well N-71 Development
depth to water (ft)
-71.0
-72.0
-73.0
-74.0
-75.0
-76.0
-77.0
-78.0
-79.0
-80.0
0
40
80
120
160
200
240
time (min)

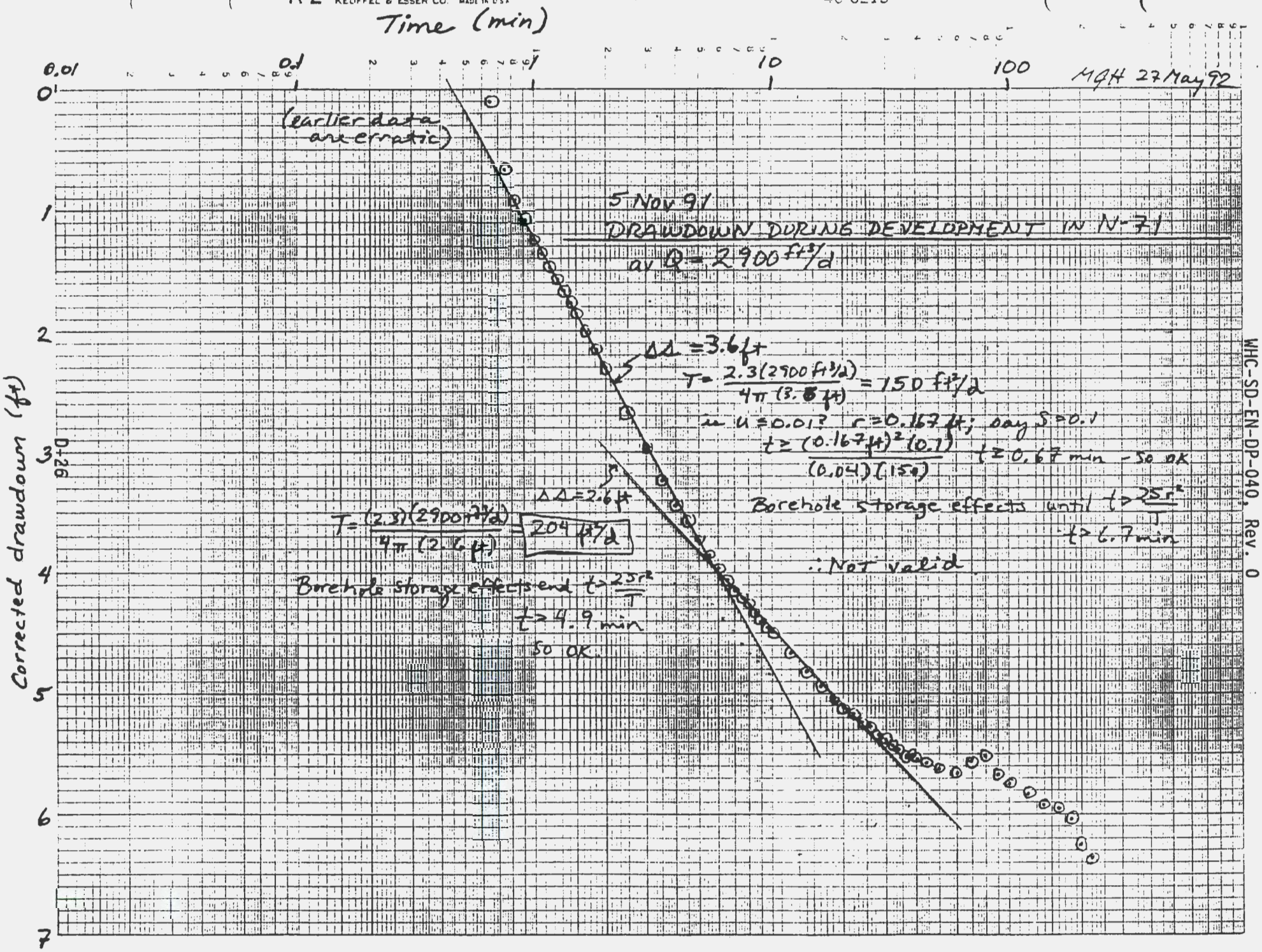

Well N-71 Development
early time data
depth to water (ft)
-71.0
-72.0
-73.0
-74.0
-75.0
-76.0
-77.0
-78.0
-79.0
-80.0
0
2
4
6
8
10
time (min)


Well N-71 Recovery
depth to water (ft)
-71.0
-72.0
-73.0
-74.0
-75.0
-76.0
-77.0
-78.0
-79.0
-80.0
0
4
8
12
16
20
time (min)


Well N-71 Recovery
early time data
depth to water (ft)
-71.0
-72.0
-73.0
-74.0
-75.0
-76.0
-77.0
-78.0
-79.0
-80.0
0
2
4
6
8
10
time (min)

9413224.0157

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6213



WELL N-71 BASELINE

p. 2 of 8

SE2000
Environmental Logger
11/06 07:53

Unit# 192 Test 0

INPUT 1: Level (F) TOC

Reference	71.710
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/05 09:50:41

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft
0	0.0000	71.710	-71.710
1	0.0167	71.713	-71.713
2	0.0333	71.713	-71.713
3	0.0500	71.713	-71.713
4	0.0667	71.710	-71.710
5	0.0833	71.713	-71.713
6	0.1000	71.710	-71.710
7	0.1167	71.710	-71.710
8	0.1333	71.706	-71.706
9	0.1500	71.710	-71.710
10	0.1667	71.710	-71.710

9413224.0158

WELL N-71 DEVELOPMENT

p. 3 of 8

SE2000
Environmental Logger
11/06 07:50

Unit# 192 Test 1

INPUT 1: Level (F) TOC

Reference	71.710
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

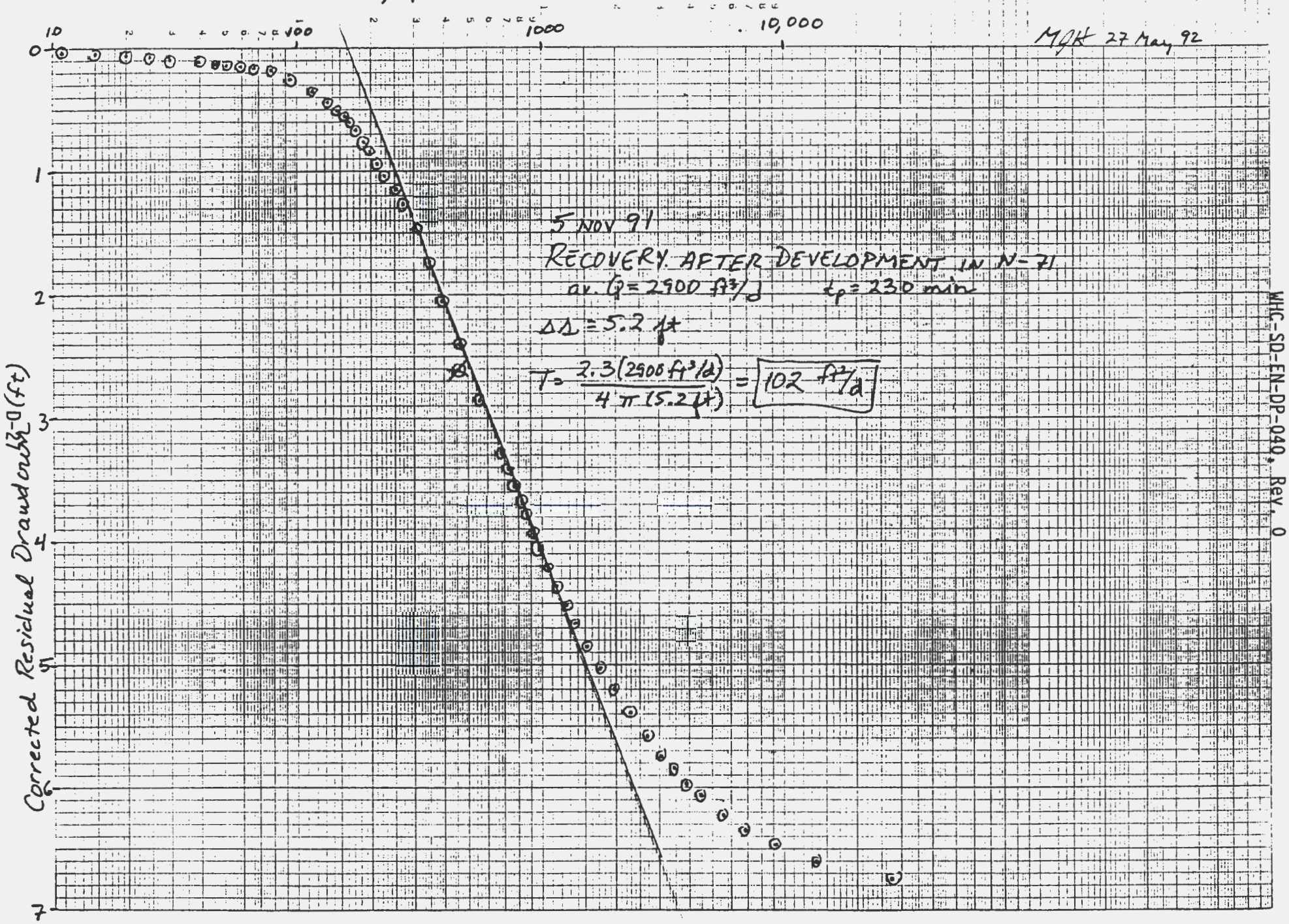
Step 0 11/05 10:01:32

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0.0000	0.0000	72.395	-72.395	0.000	0.000
0.0083	0.0001	71.984	-71.984	-0.411	-0.413
0.0166	0.0003	72.092	-72.092	-0.303	-0.304
0.0250	0.0004	72.234	-72.234	-0.161	-0.161
0.0333	0.0006	72.363	-72.363	-0.032	-0.032
0.0416	0.0007	72.483	-72.483	0.088	0.088
0.0500	0.0008	72.581	-72.581	0.186	0.186
0.0583	0.0010	72.676	-72.676	0.281	0.280
0.0666	0.0011	72.758	-72.758	0.363	0.361
0.0750	0.0013	72.837	-72.837	0.442	0.440
0.0833	0.0014	72.909	-72.909	0.514	0.511
0.1000	0.0017	73.036	-73.036	0.641	0.636
0.1166	0.0019	73.140	-73.140	0.745	0.738
0.1333	0.0022	73.216	-73.216	0.821	0.813
0.1500	0.0025	73.269	-73.269	0.874	0.864
0.1666	0.0028	73.301	-73.301	0.906	0.896
0.1833	0.0031	73.279	-73.279	0.884	0.874
0.2000	0.0033	73.184	-73.184	0.789	0.781
0.2166	0.0036	73.058	-73.058	0.663	0.658
0.2333	0.0039	72.894	-72.894	0.499	0.496
0.2500	0.0042	72.774	-72.774	0.379	0.377
0.2666	0.0044	72.676	-72.676	0.281	0.280
0.2833	0.0047	72.603	-72.603	0.208	0.207
0.3000	0.0050	72.540	-72.540	0.145	0.145
0.3166	0.0053	72.499	-72.499	0.104	0.104
0.3333	0.0056	72.448	-72.448	0.053	0.053
0.4166	0.0069	72.249	-72.249	-0.146	-0.146

9413224.0160

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6213



BOREHOLE TEST INFORMATION
WHC-SD-EN-DP-040, Rev 0

VALIDATED KDR 2/19/92

Page 1 of ~~8~~ 1 4/14/92

Borehole 199-N-71 Borehole Diameter 4" Hanford Coordinates —NA—

Interval Tested 88.42' - 67.~~66~~38' Depth Interval 88.42'-67.38'

Test Type INSTANTANEOUS SLUG TEST INJECTION/WITHDRAWAL Borehole Depth 88.42'

Instruction Used WHC-CM-7-7-EII 10.1

EQUIPMENT

NAME	DESCRIPTION
ELECTRIC SOUNDER	SOUNST SN-ET-5
DATA LOGGER.	IN-SITU INC. SN.-2K192
PRESSURE TRANSDUCER	IN-SITU INC. S.N.-26236
SLUGGING ROD	2.0' x 6.0' 0.13 FT^3
STEEL MEASURING TAPE	500' GRADUATED STEEL TAPE

MEASUREMENT DATUM

Control Datum TOP OF CASING 6" (T.O.C. 6")

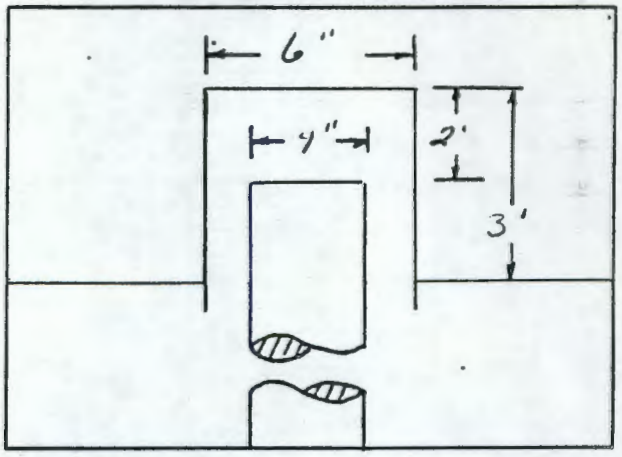
Elevation NA

Electric Sounder T.O.C. 6"

Steel Tape T.O.C. 6"

Pressure Transducer T.O.C. 6"

WELL HEAD DIAGRAM



COMMENTS

Recorded by: JAMES A. COATES JAMES A. COATES 11/22/91

Sign and Print Name Date

BD-6000-295 (05/89)

9413224.0161

~~298~~ 14,114 4/1/94

INSTANTANEOUS SLUG TEST DATA SHEET

INJECTION

Borehole 199-N-71

Interval Tested ~~71.71 mBTOC~~ 88.42' - 67.28'

Depth to Water 71.71'

Date 11/5/91

Measured by James A. Coates

Slug Volume -13ft³ Barometer Reading (Beginning) -NA- (End) -NA-

Time 1545 - injection baseline, 1555 - injection

Transducer Measurement Units Feet

Depth to Transducer 9.272' BWL

Initial Pressure (P_i) 71.710'

Slug Level or Pressure (P_{max}) 69.922

Borehole Diameter 4"

Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement
		See attached data			See attached data			

Recorded by ~~James A. Coates~~ James A. Coates (Sign and Print Name) 11/05/91 (Date)

BD-6000-293 (07/90)

9413224.0162

N-71 BASELINE FOR SLUG TESTS

p. 2 of 6

SE2000
Environmental Logger
11/06 07:46

Unit# 192 Test 3

INPUT 1: Level (F) TOC

Reference	71.710
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/05 15:47:10

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft
0	0.0000	71.735	-71.735
1	0.0167	71.735	-71.735
2	0.0333	71.735	-71.735
3	0.0500	71.735	-71.735
4	0.0667	71.732	-71.732
5	0.0833	71.728	-71.728
6	0.1000	71.725	-71.725
7	0.1167	71.722	-71.722
8	0.1333	71.719	-71.719
9	0.1500	71.716	-71.716
10	0.1667	71.713	-71.713

9110724.0163

N-71 SLUG INJECTION

p 3 of 6

SE2000
Environmental Logger
11/06 07:44

Unit# 192 Test 4

INPUT 1: Level (F) TOC

Reference	71.710	
SG	1.000	
Linearity	0.000	
Scale factor	9.998	
Offset	0.000	slug volume = 0.13 ft3
Delay mSEC	50.000	theoretical d(Y) = 1.5 ft

Step 0 11/05 15:58:00

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/dYo)
0.0000	0.0000	70.058	-70.058	1.652	1.1013
0.0083	0.0001	69.922	-69.922	1.788	1.1920
0.0166	0.0003	72.152	-72.152	-0.442	-0.2947
0.0250	0.0004	71.040	-71.040	0.67	0.4467
0.0333	0.0006	71.223	-71.223	0.487	0.3247
0.0416	0.0007	71.394	-71.394	0.316	0.2107
0.0500	0.0008	71.252	-71.252	0.458	0.3053
0.0583	0.0010	71.353	-71.353	0.357	0.2380
0.0666	0.0011	71.381	-71.381	0.329	0.2193
0.0750	0.0013	71.283	-71.283	0.427	0.2847
0.0833	0.0014	71.410	-71.410	0.3	0.2000
0.1000	0.0017	71.350	-71.350	0.36	0.2400
0.1166	0.0019	71.406	-71.406	0.304	0.2027
0.1333	0.0022	71.441	-71.441	0.269	0.1793
0.1500	0.0025	71.444	-71.444	0.266	0.1773
0.1666	0.0028	71.419	-71.419	0.291	0.1940
0.1833	0.0031	71.463	-71.463	0.247	0.1647
0.2000	0.0033	71.492	-71.492	0.218	0.1453
0.2166	0.0036	71.488	-71.488	0.222	0.1480
0.2333	0.0039	71.498	-71.498	0.212	0.1413
0.2500	0.0042	71.514	-71.514	0.196	0.1307
0.2666	0.0044	71.520	-71.520	0.19	0.1267
0.2833	0.0047	71.526	-71.526	0.184	0.1227
0.3000	0.0050	71.536	-71.536	0.174	0.1160
0.3166	0.0053	71.542	-71.542	0.168	0.1120
0.3333	0.0056	71.552	-71.552	0.158	0.1053
0.4166	0.0069	71.580	-71.580	0.13	0.0867
0.5000	0.0083	71.605	-71.605	0.105	0.0700

N-71 SLUG INJECTION

p. 4 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/dYo)
0.5833	0.0097	71.624	-71.624	0.086	0.0573
0.6666	0.0111	71.640	-71.640	0.07	0.0467
0.7500	0.0125	71.653	-71.653	0.057	0.0380
0.8333	0.0139	71.662	-71.662	0.048	0.0320
0.9166	0.0153	71.668	-71.668	0.042	0.0280
1.0000	0.0167	71.675	-71.675	0.035	0.0233
1.0833	0.0181	71.681	-71.681	0.029	0.0193
1.1666	0.0194	71.684	-71.684	0.026	0.0173
1.2500	0.0208	71.687	-71.687	0.023	0.0153
1.3333	0.0222	71.687	-71.687	0.023	0.0153
1.4166	0.0236	71.691	-71.691	0.019	0.0127
1.5000	0.0250	71.694	-71.694	0.016	0.0107
1.5833	0.0264	71.694	-71.694	0.016	0.0107
1.6666	0.0278	71.694	-71.694	0.016	0.0107
1.7500	0.0292	71.697	-71.697	0.013	0.0087
1.8333	0.0306	71.697	-71.697	0.013	0.0087
1.9166	0.0319	71.697	-71.697	0.013	0.0087
2.0000	0.0333	71.700	-71.700	0.01	0.0067
2.5000	0.0417	71.703	-71.703	0.007	0.0047
3.0000	0.0500	71.703	-71.703	0.007	0.0047
3.5000	0.0583	71.703	-71.703	0.007	0.0047
4.0000	0.0667	71.703	-71.703	0.007	0.0047
4.5000	0.0750	71.700	-71.700	0.01	0.0067
5.0000	0.0833	71.700	-71.700	0.01	0.0067
5.5000	0.0917	71.697	-71.697	0.013	0.0087
6.0000	0.1000	71.697	-71.697	0.013	0.0087
6.5000	0.1083	71.697	-71.697	0.013	0.0087
7.0000	0.1167	71.697	-71.697	0.013	0.0087
7.5000	0.1250	71.697	-71.697	0.013	0.0087
8.0000	0.1333	71.697	-71.697	0.013	0.0087
8.5000	0.1417	71.697	-71.697	0.013	0.0087
9.0000	0.1500	71.697	-71.697	0.013	0.0087
9.5000	0.1583	71.697	-71.697	0.013	0.0087
10.0000	0.1667	71.697	-71.697	0.013	0.0087

N-71 SLUG WITHDRAWAL

p. 5 of 6

SE2000
Environmental Logger
11/06 07:42

Unit# 192 Test 5

INPUT 1: Level (F) TOC

Reference	71.710
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

slug rod volume = 0.13 ft3

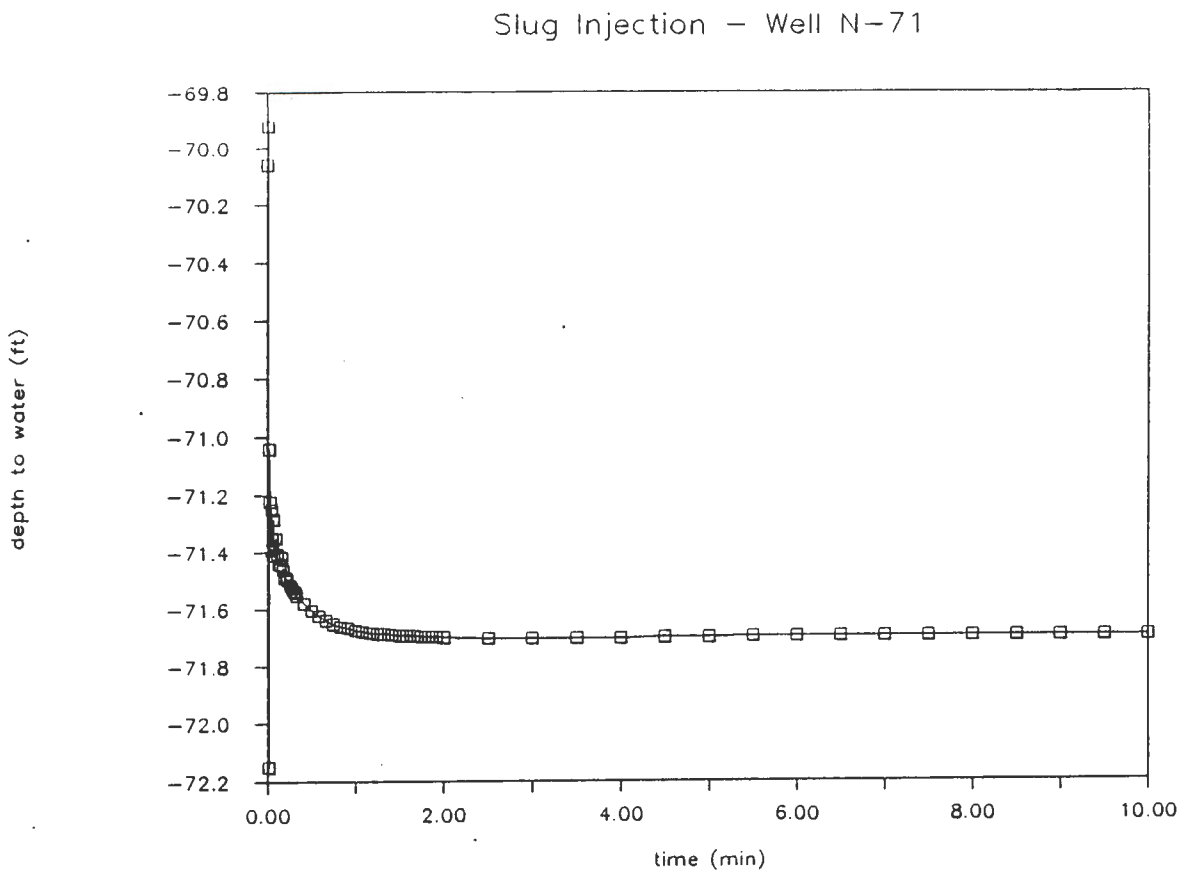
Step 0 11/05 16:10:32 theoretical d(y) = 1.5 ft

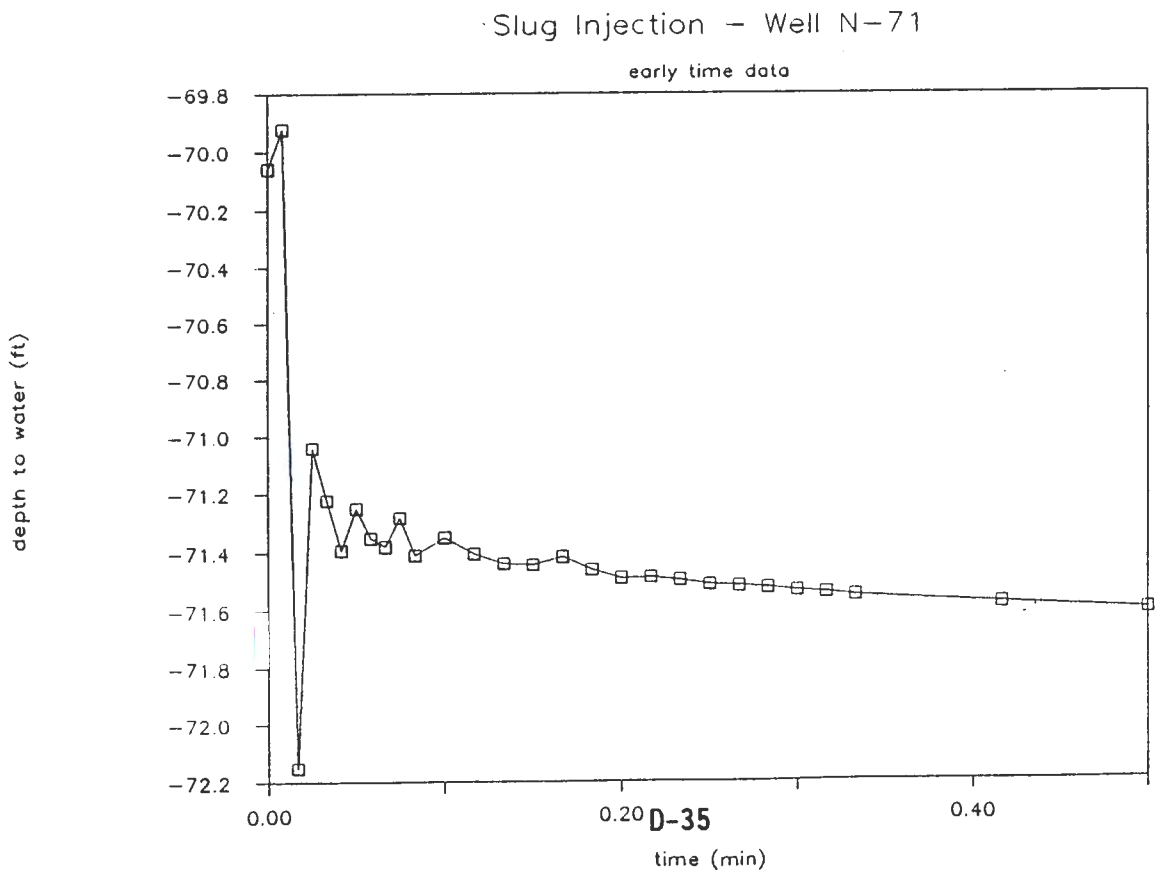
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo
0.0000	0.0000	72.272	-72.272	0.562	0.3747
0.0083	0.0001	73.355	-73.355	1.645	1.0967
0.0166	0.0003	73.197	-73.197	1.487	0.9913
0.0250	0.0004	73.026	-73.026	1.316	0.8773
0.0333	0.0006	72.909	-72.909	1.199	0.7993
0.0416	0.0007	72.805	-72.805	1.095	0.7300
0.0500	0.0008	72.688	-72.688	0.978	0.6520
0.0583	0.0010	72.600	-72.600	0.89	0.5933
0.0666	0.0011	72.502	-72.502	0.792	0.5280
0.0750	0.0013	72.411	-72.411	0.701	0.4673
0.0833	0.0014	72.341	-72.341	0.631	0.4207
0.1000	0.0017	72.231	-72.231	0.521	0.3473
0.1166	0.0019	72.148	-72.148	0.438	0.2920
0.1333	0.0022	72.088	-72.088	0.378	0.2520
0.1500	0.0025	72.041	-72.041	0.331	0.2207
0.1666	0.0028	72.006	-72.006	0.296	0.1973
0.1833	0.0031	71.978	-71.978	0.268	0.1787
0.2000	0.0033	71.959	-71.959	0.249	0.1660
0.2166	0.0036	71.937	-71.937	0.227	0.1513
0.2333	0.0039	71.921	-71.921	0.211	0.1407
0.2500	0.0042	71.905	-71.905	0.195	0.1300
0.2666	0.0044	71.893	-71.893	0.183	0.1220
0.2833	0.0047	71.880	-71.880	0.17	0.1133
0.3000	0.0050	71.867	-71.867	0.157	0.1047
0.3166	0.0053	71.858	-71.858	0.148	0.0987
0.3333	0.0056	71.848	-71.848	0.138	0.0920
0.4166	0.0069	71.814	-71.814	0.104	0.0693
0.5000	0.0083	71.785	-71.785	0.075	0.0500

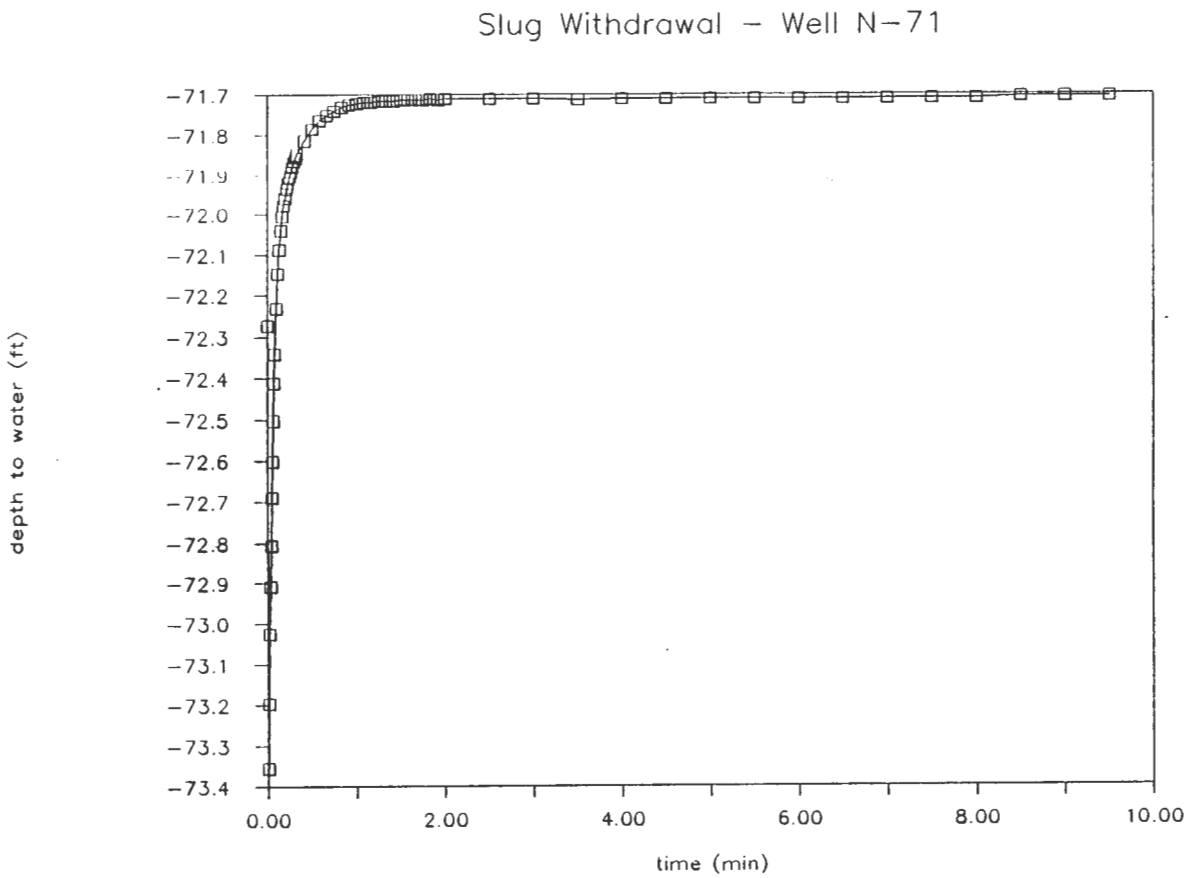
N-71 SLUG WITHDRAWAL

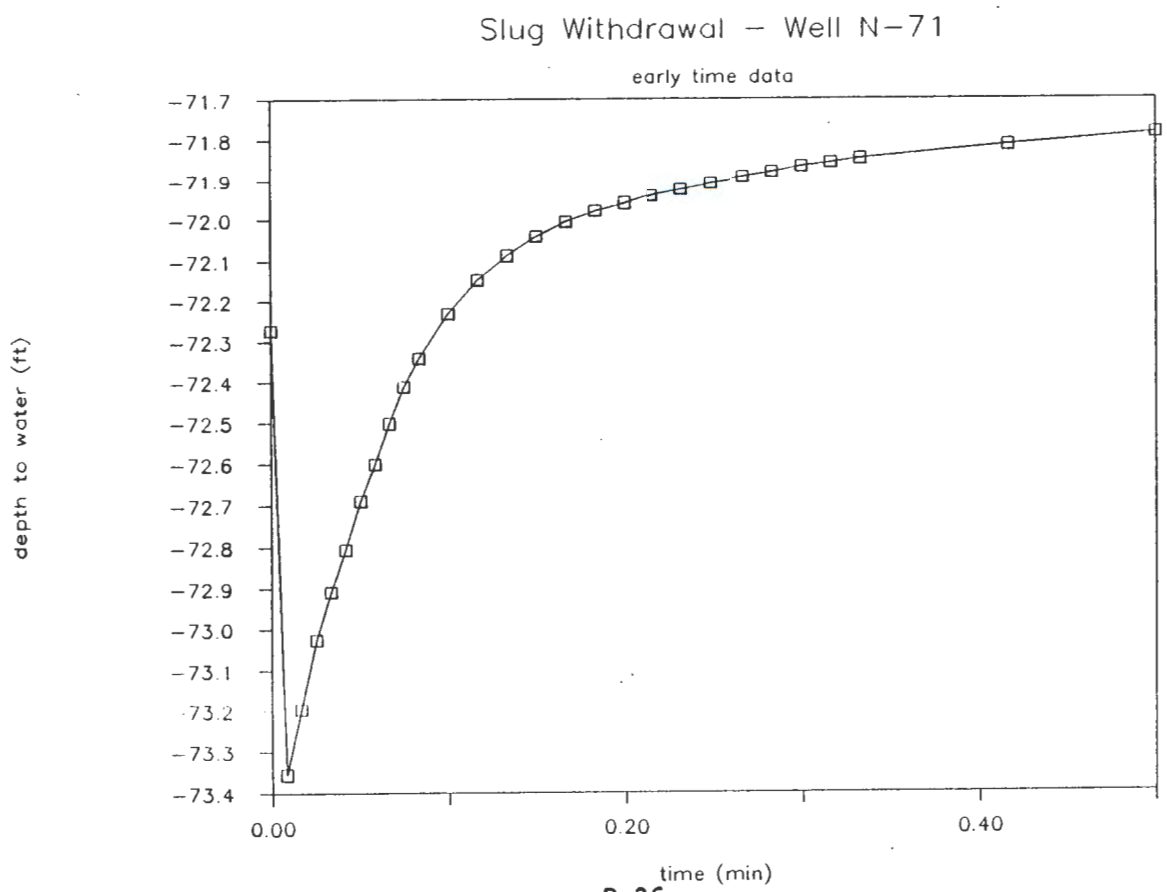
p. 6 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo
0.5833	0.0097	71.763	-71.763	0.053	0.0353
0.6666	0.0111	71.751	-71.751	0.041	0.0273
0.7500	0.0125	71.741	-71.741	0.031	0.0207
0.8333	0.0139	71.732	-71.732	0.022	0.0147
0.9166	0.0153	71.725	-71.725	0.015	0.0100
1.0000	0.0167	71.722	-71.722	0.012	0.0080
1.0833	0.0181	71.719	-71.719	0.009	0.0060
1.1666	0.0194	71.719	-71.719	0.009	0.0060
1.2500	0.0208	71.716	-71.716	0.006	0.0040
1.3333	0.0222	71.716	-71.716	0.006	0.0040
1.4166	0.0236	71.716	-71.716	0.006	0.0040
1.5000	0.0250	71.713	-71.713	0.003	0.0020
1.5833	0.0264	71.713	-71.713	0.003	0.0020
1.6666	0.0278	71.713	-71.713	0.003	0.0020
1.7500	0.0292	71.713	-71.713	0.003	0.0020
1.8333	0.0306	71.710	-71.710	0	0.0000
1.9166	0.0319	71.713	-71.713	0.003	0.0020
2.0000	0.0333	71.710	-71.710	0	0.0000
2.5000	0.0417	71.710	-71.710	0	0.0000
3.0000	0.0500	71.710	-71.710	0	0.0000
3.5000	0.0583	71.713	-71.713	0.003	0.0020
4.0000	0.0667	71.710	-71.710	0	0.0000
4.5000	0.0750	71.710	-71.710	0	0.0000
5.0000	0.0833	71.710	-71.710	0	0.0000
5.5000	0.0917	71.710	-71.710	0	0.0000
6.0000	0.1000	71.710	-71.710	0	0.0000
6.5000	0.1083	71.710	-71.710	0	0.0000
7.0000	0.1167	71.710	-71.710	0	0.0000
7.5000	0.1250	71.710	-71.710	0	0.0000
8.0000	0.1333	71.710	-71.710	0	0.0000
8.5000	0.1417	71.706	-71.706	-0.004	-0.0027
9.0000	0.1500	71.706	-71.706	-0.004	-0.0027
9.5000	0.1583	71.706	-71.706	-0.004	-0.0027


Slug Injection – Well N-71
depth to water (ft)
-69.8
-70.0
-70.2
-70.4
-70.6
-70.8
-71.0
-71.2
-71.4
-71.6
-71.8
-72.0
-72.2
0.00
2.00
4.00
6.00
8.00
10.00
time (min)


Slug Injection – Well N-71
early time data
depth to water (ft)
-69.8
-70.0
-70.2
-70.4
-70.6
-70.8
-71.0
-71.2
-71.4
-71.6
-71.8
-72.0
-72.2
0.00
0.20
0.40
time (min)


Slug Withdrawal – Well N-71
depth to water (ft)
-71.7
-71.8
-71.9
-72.0
-72.1
-72.2
-72.3
-72.4
-72.5
-72.6
-72.7
-72.8
-72.9
-73.0
-73.1
-73.2
-73.3
-73.4
0.00
2.00
4.00
6.00
8.00
10.00
time (min)


Slug Withdrawal – Well N-71
early time data
depth to water (ft)
-71.7
-71.8
-71.9
-72.0
-72.1
-72.2
-72.3
-72.4
-72.5
-72.6
-72.7
-72.8
-72.9
-73.0
-73.1
-73.2
-73.3
-73.4
0.00
0.20
0.40
time (min)

199-N-71 Slug Injection Calculations

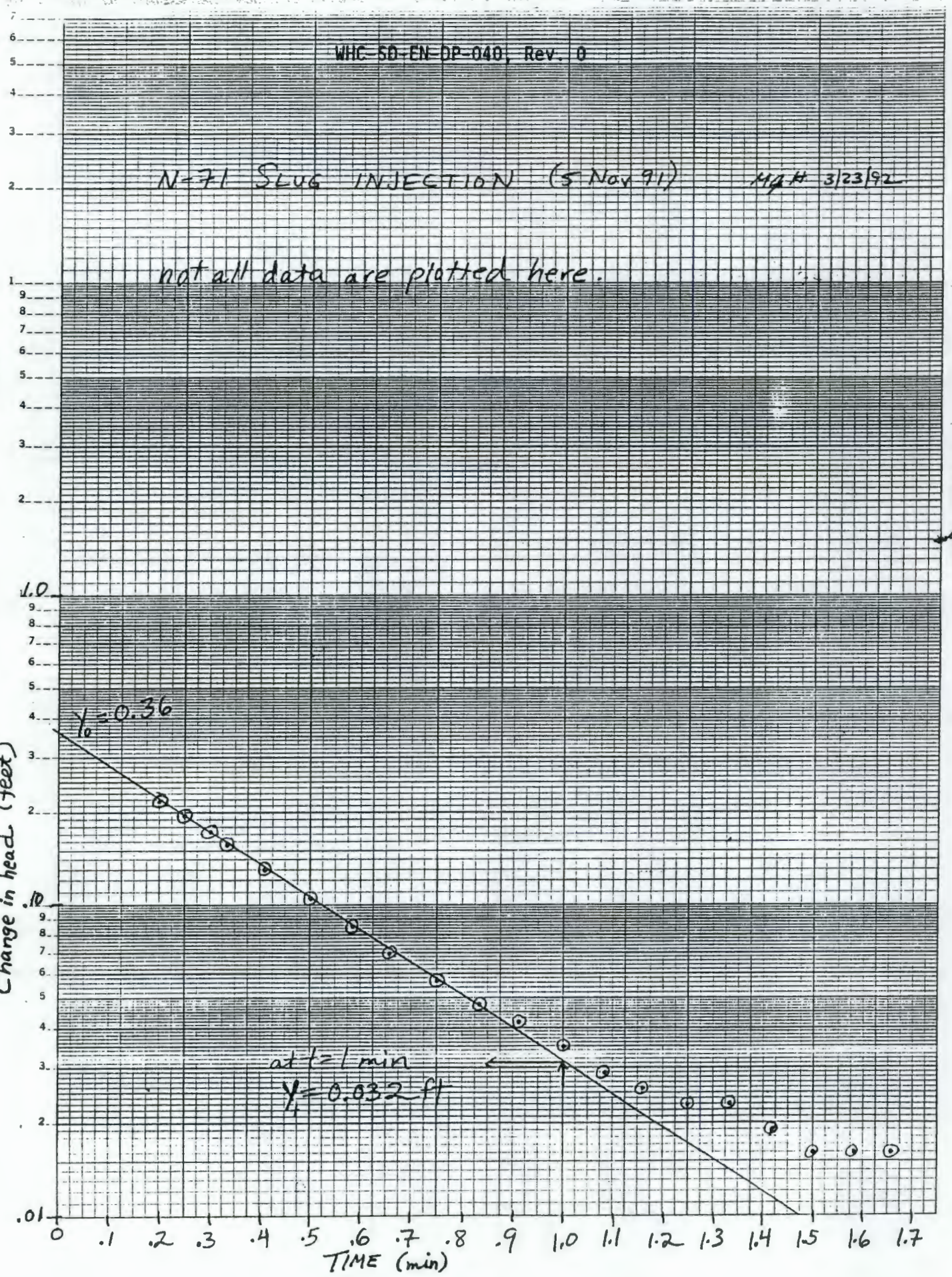
```
*****************************************************
THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

*************************************************
r_c (ft)    r_w (ft)   L_e (ft)    L_w (ft)    H (ft)
-------------------------------------------------
  .2298      .3330   16.7000      16.7000     40.0000
*************************************************

L_e/r_w =    50.1501500
A=            3.1010890
B=            5.087996E-001
C=            2.7160790
SANDPACK POROSITY=  3.000000E-001
t (min)=      1.0000000
1/t=          1.0000000
Y_o= (ft)     3.600000E-001
Y_t= (ft)     3.200000E-002
1/t ln(Y_o/Y_t)=          2.4203680
ln[(H-L_w)/r_w]=          4.2480660
ln(r_e/r_w)=              2.5913180

*************************************************
K (ft/day) =         14.2745200
*************************************************
T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)=        238.3845000
*************************************************
```


N-71 SLUG INJECTION (5 Nov 91)
MJH 3/23/92
not all data are plotted here.
$Y_0 = 0.36$
at t = 1 min
$Y_1 = 0.032$ ft
Change in head (feet)
TIME (min)
46 6013
SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

199-N-71 Slug Withdrawal Calculations -- early time

****
THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.
****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	16.7000	16.7000	40.0000

****
L_e/r_w = 50.1501500
A= 3.1010890
B= 5.087996E-001
C= 2.7160790
SANDPACK POROSITY= 3.000000E-001
t (min)= 2.000000E-001
1/t= 5.0000000
Y_o= (ft) 1.7000000
Y_t= (ft) 1.600000E-001
$1/t \ln(Y_o/Y_t)$= 11.8160500
$\ln[(H-L_w)/r_w]$= 4.2480660
$\ln(r_e/r_w)$= 2.5913180

****
K (ft/day) = 69.6871000
This value probably represents the sand pack.
****
T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 1163.7750000
This value probably represents the sand pack.
****

199-N-71 Slug Withdrawal Calculations -- Middle time

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	16.7000	16.7000	40.0000

****

L_e/r_w = 50.1501500
A= 3.1010890
B= 5.087996E-001
C= 2.7160790
SANDPACK POROSITY= 3.000000E-001
t (min)= 1.0000000
1/t= 1.0000000
Y_o= (ft) 5.000000E-001
Y_t= (ft) 1.100000E-002
$1/t \ln(Y_o/Y_t)$= 3.8167130
$\ln[(H-L_w)/r_w]$= 4.2480660
$\ln(r_e/r_w)$= 2.5913180

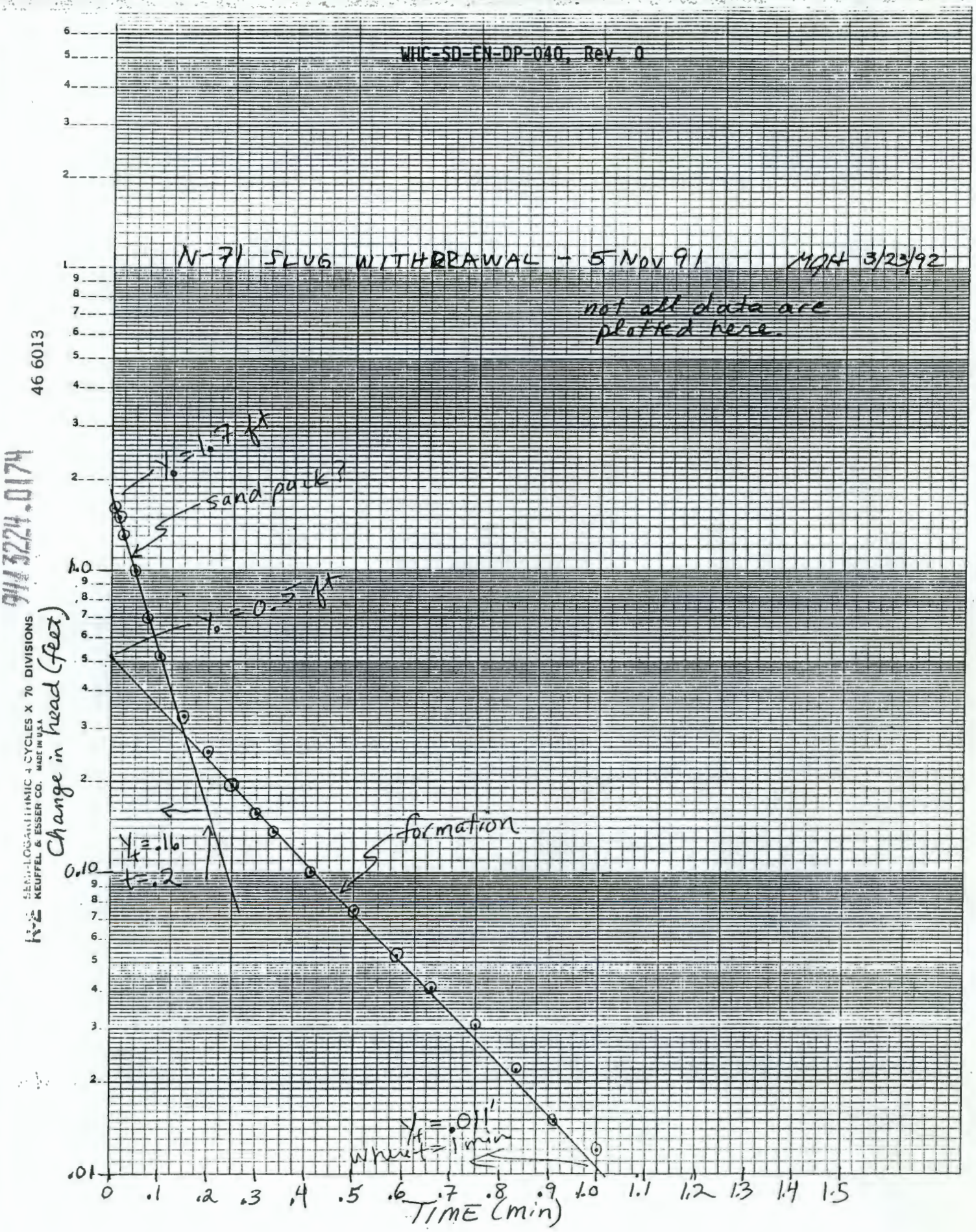
****

K (ft/day) = 22.5096900

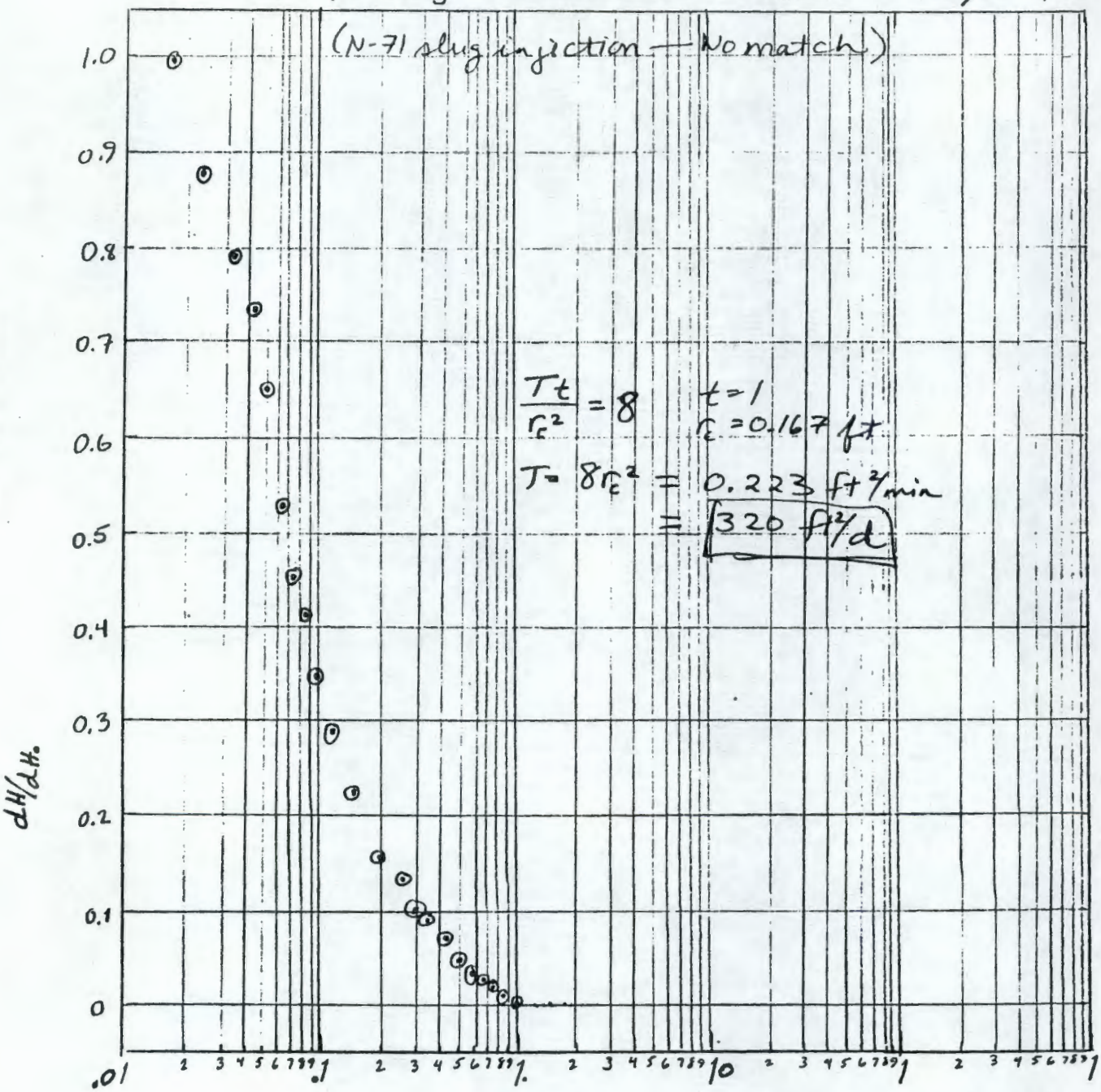
****

T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 375.9119000

****


N-71 SLUG WITHDRAWAL - 5 Nov 91
MJH 3/23/92
not all data are plotted here.
Y_o = 1.7 ft
sand pack?
Y_o = 0.5 ft
formation
Y_t = .16
t = .2
Y_t = .011'
where t = 1 min
Change in head (feet)
TIME (min)
46 6013
SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

N-71 Slug Withdrawal - 5 Nov 91 MgH 3/25/91



Matches best to line source approx'n curve. t=1 corresponds to 8 on the curve.

9413274.0175

9413224.0176

WELL 199-N-72

AQUIFER TEST SUMMARY

WELL 199-N-72 DEVELOPMENT AND RECOVERY

Purpose of Tests: The well was pumped for development. Water levels were measured during drawdown and recovery for use in estimating aquifer transmissivity.

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 88.33 to 67.30 ft below top of casing; Water level at 68.01 ft below top of casing; tested thickness = 20.32 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 7 Nov 91 Start Time of Test: 08:26

Pumping Rate: Average discharge = 12.2 gal/min (2300 ft^3/d)

Duration of Test: Discharge: 22 min; Recovery monitored for 16 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 1.91 ft

RESULTS:

Cooper and Jacob (1946) attempted unsuccessfully.

Remarks:

The extremely short duration of this test limited interpretation.

Cooper and Jacob analysis: The semilog plot produced a straight line from which a T was estimated. However, the data analyzed were all in the first 2 min of the test, during which time borehole storage was dominant.

AQUIFER TEST SUMMARY

WELL 199-N-72 SLUG INJECTION AND WITHDRAWAL

Purpose of Tests: To estimate aquifer transmissivity or hydraulic conductivity

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 88.33 to 67.30 ft below top of casing; Water level at 68.01 ft below top of casing; tested thickness = 20.32 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 8 Nov 91 Start Time of Test: 09:39

Slugging Rod Dimension: 2-in-diameter by 6-ft length (0.13 ft^3)

Duration of Test: Injection: 12 min; Withdrawal: 12 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 2.5 ft (see remarks)

RESULTS:

Methods	Transmissivity* (ft^2/d)	Hydraulic Conductivity* (ft/d)	Storativity
Bouwer and Rice: Injection	400	19	Not determined
Bouwer and Rice: Withdrawal	430	21	Not determined
Cooper et al.: Withdrawal	440	22	Not determined

* Bouwer and Rice method estimates hydraulic conductivity; Cooper et al. estimates transmissivity. The other property was estimated by the equation T=Kb, where b = screened aquifer thickness.

Remarks:

Water levels recovered rapidly (approximately 1 min) after slug injection and withdrawal. Very early data after slug injection oscillated significantly and were not analyzed.

Bouwer and Rice anlaysis: Withdrawal data appear to illustrate a change in slope at 0.15 min. The early data are believed to be indicative of the more permeable sand pack. Sand pack conductivity was calculated to be 77 ft/d.

Cooper et al. analysis: Injection data could not be matched to a type curve. Withdrawal data matched best to the "line source approximation" on the Cooper type curves; however, it was a poor match.

Results from the two methods for injection and withdrawal are in good agreement.

9413224.0179

DRAWDOWN/RECOVERY

Well Designation 199-N-72 Date 11-7-91

Well Depth 88.33' BTOC Screened Interval 88.33'-67.30'

Pumping Method Constant Discharge

Equipment Used to Measure Water Level E-Tape/Transducer S.N ET-5/262362 Calibration Due 1-24-92/5-9-92

Equipment Used to Measure Flow -NA- S.N. -NA- Calibration Due -NA-

Measuring Point ~~6"~~ Top of 6" Casing (TOC) Pump Start Time 0825 Pump Stop Time 0847

Time		Water Level		Discharge
Date	Time	Reading Unit:	Water Level Unit:	Reading Unit:
				Bucket Method
				12.2 gpm 5gal/24.6 sec
				RECHECK 5gals/27 sec
				= 11.1 gpm.
		SEE ATTACHED		
		DATA		

Signature of Recorder James A. Coates James A. Coates Date 11/20/91

Sign and Print Name

A-6000-402 (03/90)

9413224.0180

WELL N-72 BASELINE

p 2 of 6

SE2000
Environmental Logger
11/08 14:51

Unit# 192 Test 1

INPUT 1: Level (F) TOC

Reference	68.010
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/07 08:15:22

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft
0	0.0000	68.010	-68.010
1	0.0167	68.000	-68.000
2	0.0333	67.997	-67.997
3	0.0500	67.994	-67.994
4	0.0667	67.994	-67.994
5	0.0833	67.994	-67.994
6	0.1000	67.994	-67.994
7	0.1167	67.994	-67.994
8	0.1333	67.994	-67.994
9	0.1500	67.994	-67.994
10	0.1667	67.997	-67.997

WELL N-72 DEVELOPMENT

p. 3 of 6

SE2000
Environmental Logger
11/08 14:49

Unit# 192 Test 2

INPUT 1: Level (F) TOC

Reference	68.010
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/07 08:26:08

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0.0000	0.0000	68.647	-68.647	0.637	0.632
0.0083	0.0001	68.215	-68.215	0.205	0.204
0.0166	0.0003	68.284	-68.284	0.274	0.273
0.0250	0.0004	68.351	-68.351	0.341	0.340
0.0333	0.0006	68.426	-68.426	0.416	0.414
0.0416	0.0007	68.486	-68.486	0.476	0.473
0.0500	0.0008	68.537	-68.537	0.527	0.524
0.0583	0.0010	68.572	-68.572	0.562	0.558
0.0666	0.0011	68.616	-68.616	0.606	0.601
0.0750	0.0013	68.651	-68.651	0.641	0.636
0.0833	0.0014	68.685	-68.685	0.675	0.669
0.1000	0.0017	68.748	-68.748	0.738	0.731
0.1166	0.0019	68.796	-68.796	0.786	0.778
0.1333	0.0022	68.846	-68.846	0.836	0.827
0.1500	0.0025	68.897	-68.897	0.887	0.877
0.1666	0.0028	68.928	-68.928	0.918	0.907
0.1833	0.0031	68.976	-68.976	0.966	0.954
0.2000	0.0033	69.014	-69.014	1.004	0.991
0.2166	0.0036	69.042	-69.042	1.032	1.019
0.2333	0.0039	69.083	-69.083	1.073	1.059
0.2500	0.0042	69.099	-69.099	1.089	1.074
0.2666	0.0044	69.118	-69.118	1.108	1.093
0.2833	0.0047	69.134	-69.134	1.124	1.108
0.3000	0.0050	69.165	-69.165	1.155	1.138
0.3166	0.0053	69.175	-69.175	1.165	1.148
0.3333	0.0056	69.197	-69.197	1.187	1.169
0.4166	0.0069	69.260	-69.260	1.25	1.230

WELL N-72 DEVELOPMENT

p. 4 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0.5000	0.0083	69.352	-69.352	1.342	1.319
0.5833	0.0097	69.405	-69.405	1.395	1.371
0.6666	0.0111	69.453	-69.453	1.443	1.417
0.7500	0.0125	69.506	-69.506	1.496	1.468
0.8333	0.0139	69.547	-69.547	1.537	1.507
0.9166	0.0153	69.576	-69.576	1.566	1.535
1.0000	0.0167	69.617	-69.617	1.607	1.575
1.0833	0.0181	69.642	-69.642	1.632	1.599
1.1666	0.0194	69.661	-69.661	1.651	1.617
1.2500	0.0208	69.686	-69.686	1.676	1.641
1.3333	0.0222	69.686	-69.686	1.676	1.641
1.4166	0.0236	69.724	-69.724	1.714	1.677
1.5000	0.0250	69.734	-69.734	1.724	1.687
1.5833	0.0264	69.737	-69.737	1.727	1.690
1.6666	0.0278	69.759	-69.759	1.749	1.711
1.7500	0.0292	69.765	-69.765	1.755	1.716
1.8333	0.0306	69.771	-69.771	1.761	1.722
1.9166	0.0319	69.778	-69.778	1.768	1.729
2.0000	0.0333	69.797	-69.797	1.787	1.747
2.5000	0.0417	69.809	-69.809	1.799	1.759
3.0000	0.0500	69.835	-69.835	1.825	1.783
3.5000	0.0583	69.850	-69.850	1.84	1.798
4.0000	0.0667	69.844	-69.844	1.834	1.792
4.5000	0.0750	69.841	-69.841	1.831	1.789
5.0000	0.0833	69.854	-69.854	1.844	1.801
5.5000	0.0917	69.847	-69.847	1.837	1.795
6.0000	0.1000	69.863	-69.863	1.853	1.810
6.5000	0.1083	69.869	-69.869	1.859	1.816
7.0000	0.1167	69.869	-69.869	1.859	1.816
7.5000	0.1250	69.850	-69.850	1.84	1.798
8.0000	0.1333	69.873	-69.873	1.863	1.820
8.5000	0.1417	69.876	-69.876	1.866	1.822
9.0000	0.1500	69.863	-69.863	1.853	1.810
9.5000	0.1583	69.873	-69.873	1.863	1.820
10.0000	0.1667	69.873	-69.873	1.863	1.820
12.0000	0.2000	69.888	-69.888	1.878	1.834
14.0000	0.2333	69.891	-69.891	1.881	1.837
16.0000	0.2667	69.904	-69.904	1.894	1.849
18.0000	0.3000	69.907	-69.907	1.897	1.852
20.0000	0.3333	69.920	-69.920	1.91	1.864
22.0000	0.3667	69.926	-69.926	1.916	1.870

WELL N-72 RECOVERY

p. 5 of 6

SE2000
Environmental Logger
11/08 14:48

Unit# 192 Test 3

INPUT 1: Level (F) TOC

Reference	68.010
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

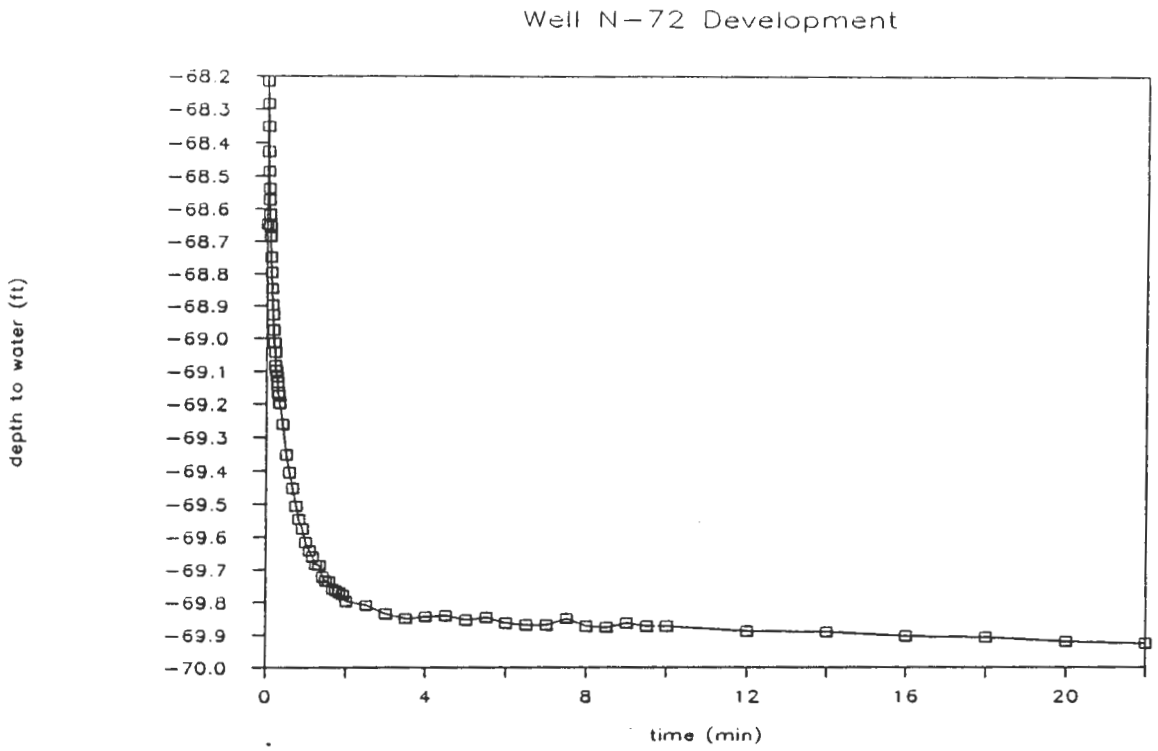
Step 0 11/07 08:50:15 tp =22 min

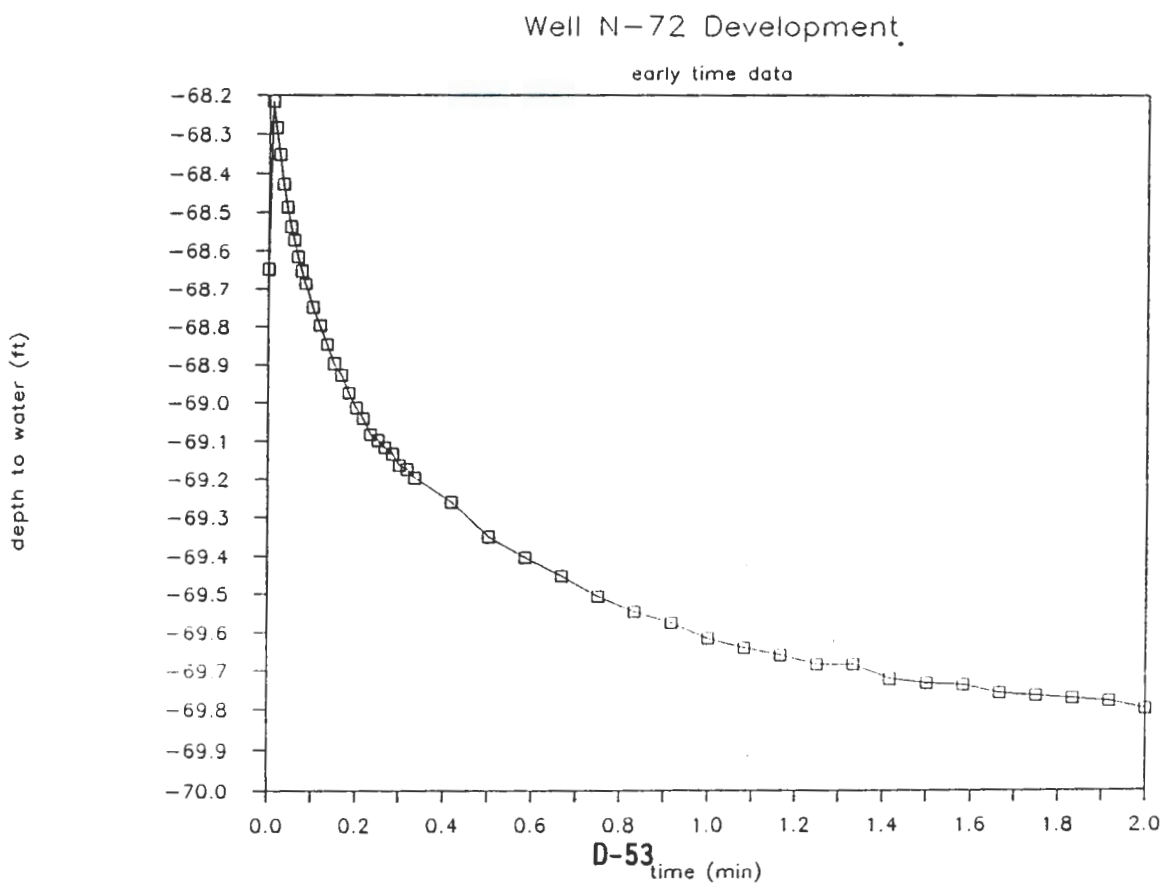
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.0000	0.0000	69.753	-69.753	1.743	1.705	
0.0083	0.0001	69.664	-69.664	1.654	1.620	2651.60
0.0166	0.0003	69.598	-69.598	1.588	1.556	1326.30
0.0250	0.0004	69.535	-69.535	1.525	1.496	881.00
0.0333	0.0006	69.475	-69.475	1.465	1.438	661.66
0.0416	0.0007	69.468	-69.468	1.458	1.431	529.85
0.0500	0.0008	69.367	-69.367	1.357	1.334	441.00
0.0583	0.0010	69.314	-69.314	1.304	1.283	378.36
0.0666	0.0011	69.269	-69.269	1.259	1.239	331.33
0.0750	0.0013	69.219	-69.219	1.209	1.191	294.33
0.0833	0.0014	69.175	-69.175	1.165	1.148	265.11
0.1000	0.0017	69.086	-69.086	1.076	1.062	221.00
0.1166	0.0019	69.004	-69.004	0.994	0.982	189.68
0.1333	0.0022	68.935	-68.935	0.925	0.914	166.04
0.1500	0.0025	68.865	-68.865	0.855	0.846	147.67
0.1666	0.0028	68.799	-68.799	0.789	0.781	133.05
0.1833	0.0031	68.739	-68.739	0.729	0.722	121.02
0.2000	0.0033	68.685	-68.685	0.675	0.669	111.00
0.2166	0.0036	68.638	-68.638	0.628	0.623	102.57
0.2333	0.0039	68.594	-68.594	0.584	0.580	95.30
0.2500	0.0042	68.549	-68.549	0.539	0.535	89.00
0.2666	0.0044	68.512	-68.512	0.502	0.499	83.52
0.2833	0.0047	68.474	-68.474	0.464	0.461	78.66
0.3000	0.0050	68.436	-68.436	0.426	0.424	74.33
0.3166	0.0053	68.404	-68.404	0.394	0.392	70.49
0.3333	0.0056	68.373	-68.373	0.363	0.361	67.01
0.4166	0.0069	68.256	-68.256	0.246	0.245	53.81

WELL N-72 RECOVERY

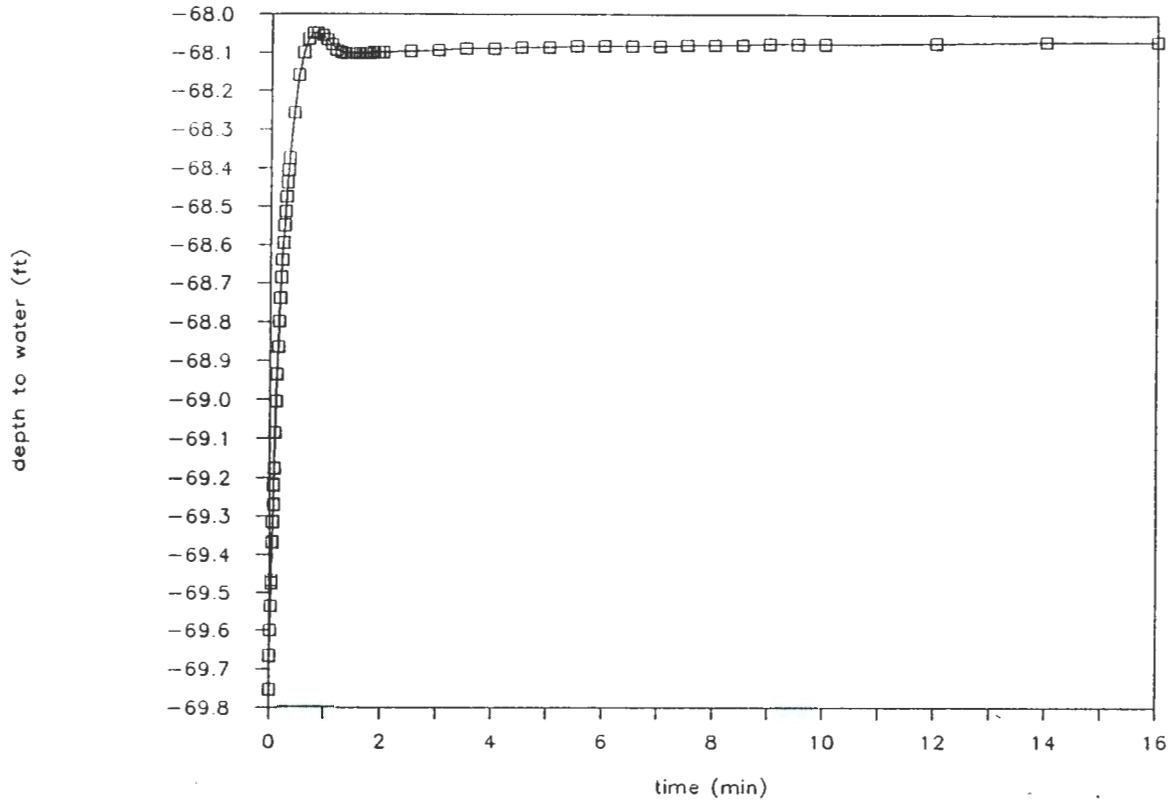
p. 6 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.5000	0.0083	68.158	-68.158	0.148	0.148	45.00
0.5833	0.0097	68.098	-68.098	0.088	0.088	38.72
0.6666	0.0111	68.063	-68.063	0.053	0.053	34.00
0.7500	0.0125	68.047	-68.047	0.037	0.037	30.33
0.8333	0.0139	68.047	-68.047	0.037	0.037	27.40
0.9166	0.0153	68.054	-68.054	0.044	0.044	25.00
1.0000	0.0167	68.066	-68.066	0.056	0.056	23.00
1.0833	0.0181	68.079	-68.079	0.069	0.069	21.31
1.1666	0.0194	68.092	-68.092	0.082	0.082	19.86
1.2500	0.0208	68.098	-68.098	0.088	0.088	18.60
1.3333	0.0222	68.101	-68.101	0.091	0.091	17.50
1.4166	0.0236	68.101	-68.101	0.091	0.091	16.53
1.5000	0.0250	68.101	-68.101	0.091	0.091	15.67
1.5833	0.0264	68.101	-68.101	0.091	0.091	14.90
1.6666	0.0278	68.101	-68.101	0.091	0.091	14.20
1.7500	0.0292	68.101	-68.101	0.091	0.091	13.57
1.8333	0.0306	68.098	-68.098	0.088	0.088	13.00
1.9166	0.0319	68.098	-68.098	0.088	0.088	12.48
2.0000	0.0333	68.098	-68.098	0.088	0.088	12.00
2.5000	0.0417	68.095	-68.095	0.085	0.085	9.80
3.0000	0.0500	68.092	-68.092	0.082	0.082	8.33
3.5000	0.0583	68.088	-68.088	0.078	0.078	7.29
4.0000	0.0667	68.088	-68.088	0.078	0.078	6.50
4.5000	0.0750	68.085	-68.085	0.075	0.075	5.89
5.0000	0.0833	68.085	-68.085	0.075	0.075	5.40
5.5000	0.0917	68.082	-68.082	0.072	0.072	5.00
6.0000	0.1000	68.082	-68.082	0.072	0.072	4.67
6.5000	0.1083	68.082	-68.082	0.072	0.072	4.38
7.0000	0.1167	68.082	-68.082	0.072	0.072	4.14
7.5000	0.1250	68.079	-68.079	0.069	0.069	3.93
8.0000	0.1333	68.079	-68.079	0.069	0.069	3.75
8.5000	0.1417	68.079	-68.079	0.069	0.069	3.59
9.0000	0.1500	68.076	-68.076	0.066	0.066	3.44
9.5000	0.1583	68.076	-68.076	0.066	0.066	3.32
10.0000	0.1667	68.076	-68.076	0.066	0.066	3.20
12.0000	0.2000	68.073	-68.073	0.063	0.063	2.83
14.0000	0.2333	68.069	-68.069	0.059	0.059	2.57
16.0000	0.2667	68.069	-68.069	0.059	0.059	2.38


Well N-72 Development
depth to water (ft)
-68.2
-68.3
-68.4
-68.5
-68.6
-68.7
-68.8
-68.9
-69.0
-69.1
-69.2
-69.3
-69.4
-69.5
-69.6
-69.7
-69.8
-69.9
-70.0
0
4
8
12
16
20
time (min)

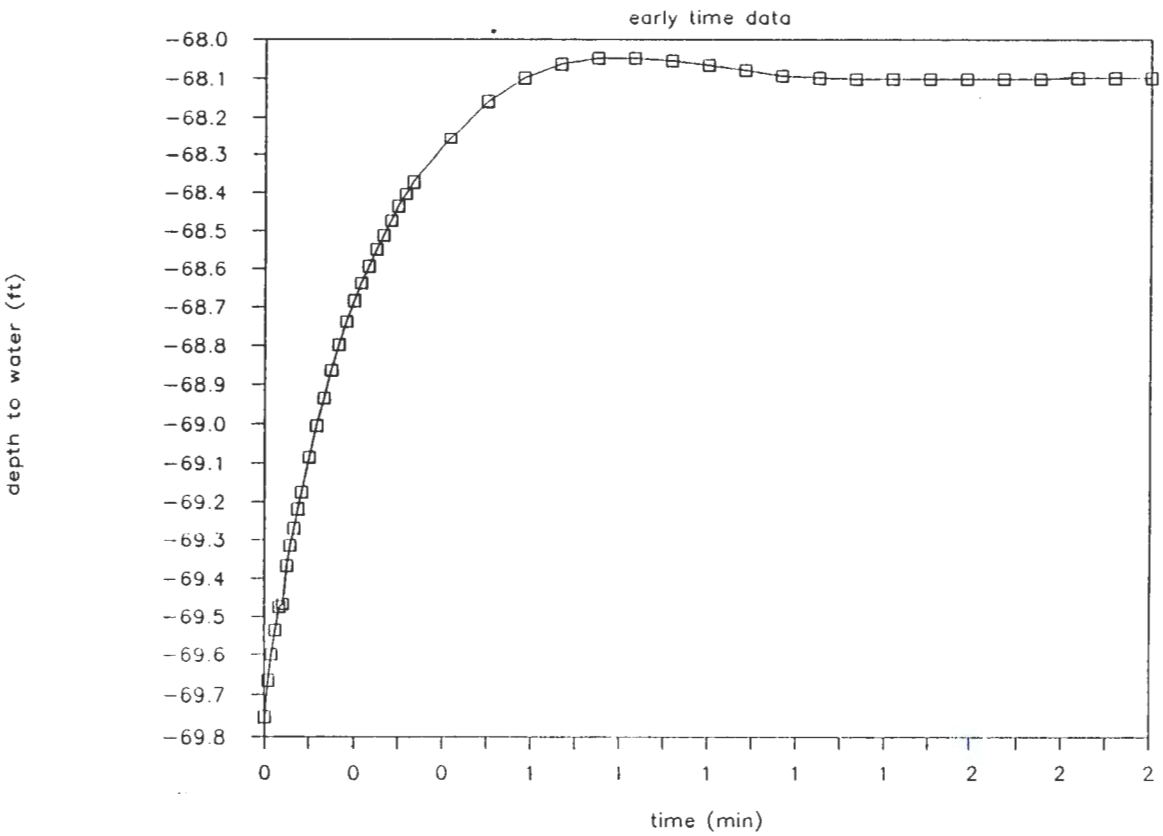

Well N-72 Development
early time data
depth to water (ft)
-68.2
-68.3
-68.4
-68.5
-68.6
-68.7
-68.8
-68.9
-69.0
-69.1
-69.2
-69.3
-69.4
-69.5
-69.6
-69.7
-69.8
-69.9
-70.0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
time (min)

Well N-72 Recovery



Well N-72 Recovery

early time data



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K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
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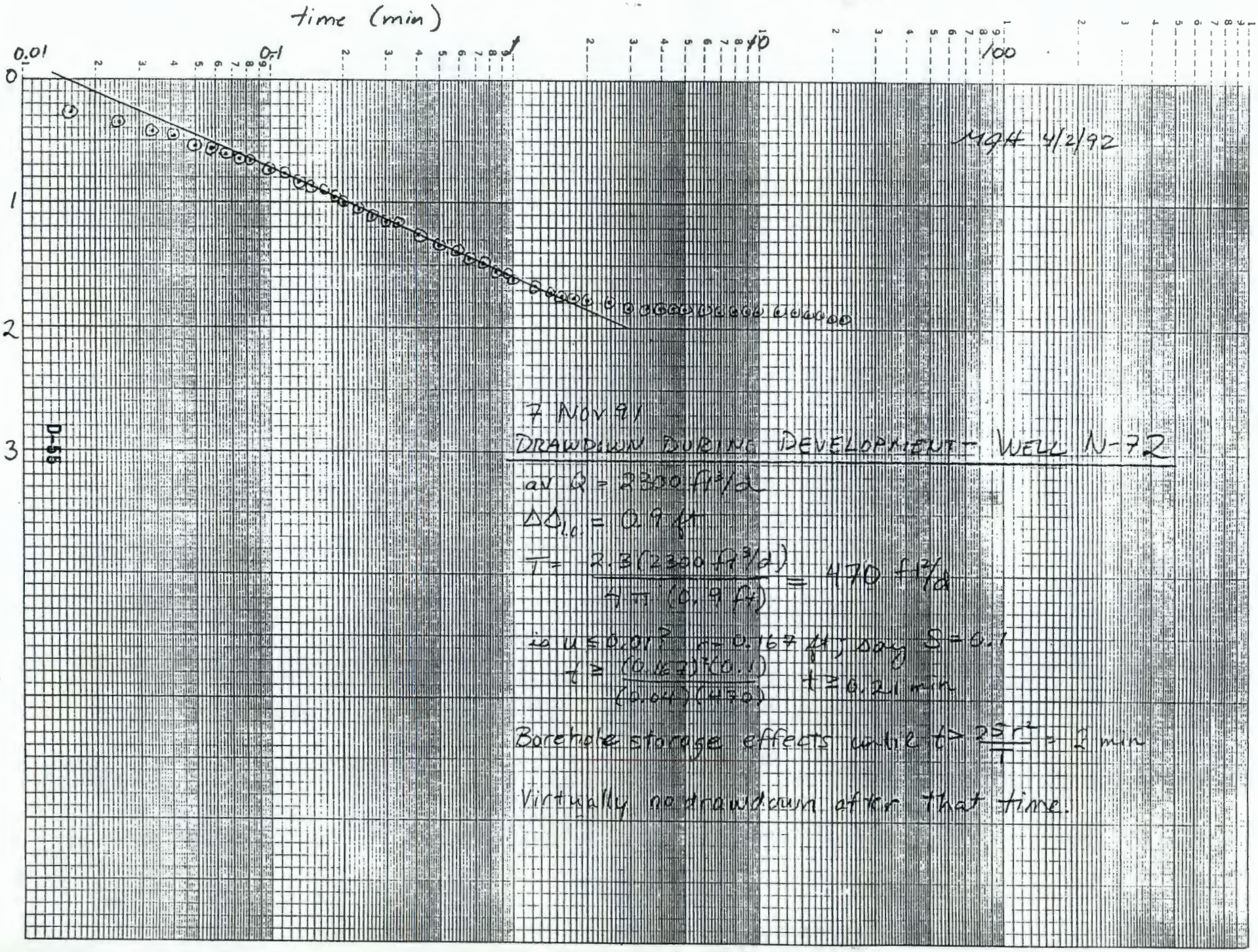

7 NOV 91

DRAWDOWN DURING DEVELOPMENT - WELL N-72

at $Q = 2300\ ft^3/d$

$\Delta s_{1.0} = 0.9\ ft$

$$T = \frac{2.3(2300\ ft^3/d)}{4\pi(0.9\ ft)} = 470\ ft^2/d$$

if $u \le 0.01$? $r = 0.167\ ft$, say $S = 0.1$

$$t \ge \frac{(0.167)^2(0.1)}{(0.04)(470)} \qquad t \ge 0.21\ min$$

Borehole storage effects until $t > \frac{25 r^2}{T} = 2\ min$

Virtually no drawdown after that time.

AQUIFER TEST SUMMARY

WELL 199-N-72 SLUG INJECTION AND WITHDRAWAL

Purpose of Tests: to estimate aquifer transmissivity or hydraulic conductivity

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 88.33 to 67.30 ft below top of casing; Water level at 68.01 ft below top of casing; tested thickness = 20.32 ft

Diameter of Well Casing: 4 in (0.333 ft)

Diameter of Well Screen: 4 in (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 8 Nov 91 Start Time of Test: 09:39

Slugging Rod Dimension: 2-in diameter by 6-ft length (0.13 ft^3)

Duration of Test: Injection: 12 min; Withdrawal: 12 min

Water-Level Measurement Methods: pressure transducer with data logger

Maximum Change in Water Level: 2.5 ft (see remarks)

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RESULTS:

Methods	Transmissivity (ft^2/d)*	Hydraulic Conductivity (ft/d)*	Storativity
Bouwer and Rice: Injection	400	19	Not determined
Bouwer and Rice: Withdrawal	430	21	Not determined
Cooper et al.: Withdrawal	440	22	

* Bouwer and Rice method estimates hydraulic conductivity; Cooper et al. estimates transmissivity. The other property was estimated by the equation T=Kb, where b = screened aquifer thickness.

Remarks:

· Water levels recovered rapidly (approximately 1 min) after slug injection and withdrawal. Very early data after slug injection oscillated significantly and were not analyzed.

Bouwer and Rice anlaysis: Withdrawal data appear to illustrate a change in slope at 0.15 min. The early data are believed to be indicative of the more permeable sand pack. Sand pack conductivity was calculated to be 77 ft/d.

Cooper et al. analysis: Injection data could not be matched to a type curve. Withdrawal data matched best to the "line source approximation" on the Cooper type curves; however, it was a poor match.

Results from the two methods for injection and withdrawal are in good agreement.

WHC-SD-EN-DP-040, Rev. 0

VALIDATED KDR 2/19/92 SIGNATURE/DATE

INSTANTANEOUS SLUG TEST DATA SHEET

-INJECTION-

Borehole 199-N-72

Interval Tested 88.33 - 67.30'

Depth to Water 68.01' BTOC

Date 11-8-91

Measured by James A. Coates

Slug Volume .13ft³ Barometer Reading (Beginning) -NA- (End) -NA-

Time 0920 - injection baseline, 0930 - injection (1184)

Transducer Measurement Units Feet

Depth to Transducer 16.46' BWL

Initial Pressure (P_i) 68.010'

Slug Level or Pressure (P_{max}) 65.505'

Borehole Diameter 4"

Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement
		SEE ATTACHED DATA			SEE ATTACHED DATA			

Recorded by James A. Coates (Sign and Print Name) James A. Coates 11/8/91 (Date)

BD-6000-293 (07/90)

WELL N-72 BASELINE FOR SLUG TESTS

p. 2 of 6

SE2000
Environmental Logger
11/08 14:47

Unit# 192 Test 4

INPUT 1: Level (F) TOC

Reference	68.010
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/08 09:19:41

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft
0	0.0000	68.006	-68.006
1	0.0167	67.997	-67.997
2	0.0333	67.987	-67.987
3	0.0500	67.987	-67.987
4	0.0667	67.984	-67.984
5	0.0833	67.984	-67.984
6	0.1000	67.987	-67.987
7	0.1167	67.984	-67.984
8	0.1333	67.987	-67.987
9	0.1500	67.987	-67.987
10	0.1667	67.987	-67.987
11	0.1833	67.987	-67.987
12	0.2000	67.987	-67.987
13	0.2167	67.984	-67.984
14	0.2333	67.984	-67.984
15	0.2500	67.984	-67.984
16	0.2667	67.987	-67.987
17	0.2833	67.984	-67.984
18	0.3000	67.987	-67.987

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WELL N-72 SLUG INJECTION

p. 3 of 6

SE2000
Environmental Logger
11/08 14:45

Unit# 192 Test 5

INPUT 1: Level (F) TOC

Reference	68.010
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

volume slugging rod = 0.13 ft3
theoretical d(Yo) = 1.5 ft

Step 0 11/08 09:39:06

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	dY/dYo
0.0000	0.0000	68.508	-68.508	-0.498	-0.3320
0.0083	0.0001	65.505	-65.505	2.505	1.6700
0.0166	0.0003	67.346	-67.346	0.664	0.4427
0.0250	0.0004	67.785	-67.785	0.225	0.1500
0.0333	0.0006	67.542	-67.542	0.468	0.3120
0.0416	0.0007	67.492	-67.492	0.518	0.3453
0.0500	0.0008	67.691	-67.691	0.319	0.2127
0.0583	0.0010	67.571	-67.571	0.439	0.2927
0.0666	0.0011	67.763	-67.763	0.247	0.1647
0.0750	0.0013	67.706	-67.706	0.304	0.2027
0.0833	0.0014	67.631	-67.631	0.379	0.2527
0.1000	0.0017	67.722	-67.722	0.288	0.1920
0.1166	0.0019	67.760	-67.760	0.25	0.1667
0.1333	0.0022	67.795	-67.795	0.215	0.1433
0.1500	0.0025	67.751	-67.751	0.259	0.1727
0.1666	0.0028	67.770	-67.770	0.24	0.1600
0.1833	0.0031	67.804	-67.804	0.206	0.1373
0.2000	0.0033	67.833	-67.833	0.177	0.1180
0.2166	0.0036	67.833	-67.833	0.177	0.1180
0.2333	0.0039	67.852	-67.852	0.158	0.1053
0.2500	0.0042	67.858	-67.858	0.152	0.1013
0.2666	0.0044	67.871	-67.871	0.139	0.0927
0.2833	0.0047	67.874	-67.874	0.136	0.0907
0.3000	0.0050	67.886	-67.886	0.124	0.0827
0.3166	0.0053	67.893	-67.893	0.117	0.0780
0.3333	0.0056	67.899	-67.899	0.111	0.0740
0.4166	0.0069	67.931	-67.931	0.079	0.0527
0.5000	0.0083	67.950	-67.950	0.06	0.0400

WELL N-72 SLUG INJECTION

p 4 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	dY/dYo
0.5833	0.0097	67.968	-67.968	0.042	0.0280
0.6666	0.0111	67.978	-67.978	0.032	0.0213
0.7500	0.0125	67.984	-67.984	0.026	0.0173
0.8333	0.0139	67.991	-67.991	0.019	0.0127
0.9166	0.0153	67.994	-67.994	0.016	0.0107
1.0000	0.0167	67.997	-67.997	0.013	0.0087
1.0833	0.0181	67.997	-67.997	0.013	0.0087
1.1666	0.0194	68.000	-68.000	0.01	0.0067
1.2500	0.0208	68.000	-68.000	0.01	0.0067
1.3333	0.0222	68.000	-68.000	0.01	0.0067
1.4166	0.0236	68.000	-68.000	0.01	0.0067
1.5000	0.0250	68.003	-68.003	0.007	0.0047
1.5833	0.0264	68.000	-68.000	0.01	0.0067
1.6666	0.0278	68.000	-68.000	0.01	0.0067
1.7500	0.0292	68.003	-68.003	0.007	0.0047
1.8333	0.0306	68.003	-68.003	0.007	0.0047
1.9166	0.0319	68.000	-68.000	0.01	0.0067
2.0000	0.0333	67.997	-67.997	0.013	0.0087
2.5000	0.0417	68.003	-68.003	0.007	0.0047
3.0000	0.0500	68.003	-68.003	0.007	0.0047
3.5000	0.0583	68.003	-68.003	0.007	0.0047
4.0000	0.0667	68.003	-68.003	0.007	0.0047
4.5000	0.0750	68.003	-68.003	0.007	0.0047
5.0000	0.0833	68.003	-68:003	0.007	0.0047
5.5000	0.0917	68.003	-68.003	0.007	0.0047
6.0000	0.1000	68.003	-68.003	0.007	0.0047
6.5000	0.1083	68.003	-68.003	0.007	0.0047
7.0000	0.1167	68.006	-68.006	0.004	0.0027
7.5000	0.1250	68.003	-68.003	0.007	0.0047
8.0000	0.1333	68.003	-68.003	0.007	0.0047
8.5000	0.1417	68.006	-68.006	0.004	0.0027
9.0000	0.1500	68.006	-68.006	0.004	0.0027
9.5000	0.1583	68.006	-68.006	0.004	0.0027
10.0000	0.1667	68.003	-68.003	0.007	0.0047
12.0000	0.2000	68.006	-68.006	0.004	0.0027

WELL N-72 SLUG WITHDRAWAL

p. 5 of 6

SE2000
Environmental Logger
11/08 14:44

Unit# 192 Test 6

INPUT 1: Level (F) TOC

Reference	68.010	
SG	1.000	
Linearity	0.000	
Scale factor	9.998	
Offset	0.000	vol. slugging rod = 0.13 ft3
Delay mSEC	50.000	theoretical d(Yo) = 1.5 ft

Step 0 11/08 09:52:25

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.0000	0.0000	68.537	-68.537	0.527	0.3513
0.0083	0.0001	69.197	-69.197	1.187	0.7913
0.0166	0.0003	69.519	-69.519	1.509	1.0060
0.0250	0.0004	69.263	-69.263	1.253	0.8353
0.0333	0.0006	69.121	-69.121	1.111	0.7407
0.0416	0.0007	68.963	-68.963	0.953	0.6353
0.0500	0.0008	68.827	-68.827	0.817	0.5447
0.0583	0.0010	68.711	-68.711	0.701	0.4673
0.0666	0.0011	68.619	-68.619	0.609	0.4060
0.0750	0.0013	68.546	-68.546	0.536	0.3573
0.0833	0.0014	68.489	-68.489	0.479	0.3193
0.1000	0.0017	68.414	-68.414	0.404	0.2693
0.1166	0.0019	68.363	-68.363	0.353	0.2353
0.1333	0.0022	68.325	-68.325	0.315	0.2100
0.1500	0.0025	68.300	-68.300	0.29	0.1933
0.1666	0.0028	68.275	-68.275	0.265	0.1767
0.1833	0.0031	68.253	-68.253	0.243	0.1620
0.2000	0.0033	68.234	-68.234	0.224	0.1493
0.2166	0.0036	68.221	-68.221	0.211	0.1407
0.2333	0.0039	68.202	-68.202	0.192	0.1280
0.2500	0.0042	68.186	-68.186	0.176	0.1173
0.2666	0.0044	68.177	-68.177	0.167	0.1113
0.2833	0.0047	68.167	-68.167	0.157	0.1047
0.3000	0.0050	68.155	-68.155	0.145	0.0967
0.3166	0.0053	68.148	-68.148	0.138	0.0920
0.3333	0.0056	68.136	-68.136	0.126	0.0840
0.4166	0.0069	68.104	-68.104	0.094	0.0627
0.5000	0.0083	68.079	-68.079	0.069	0.0460
0.5833	0.0097	68.060	-68.060	0.05	0.0333

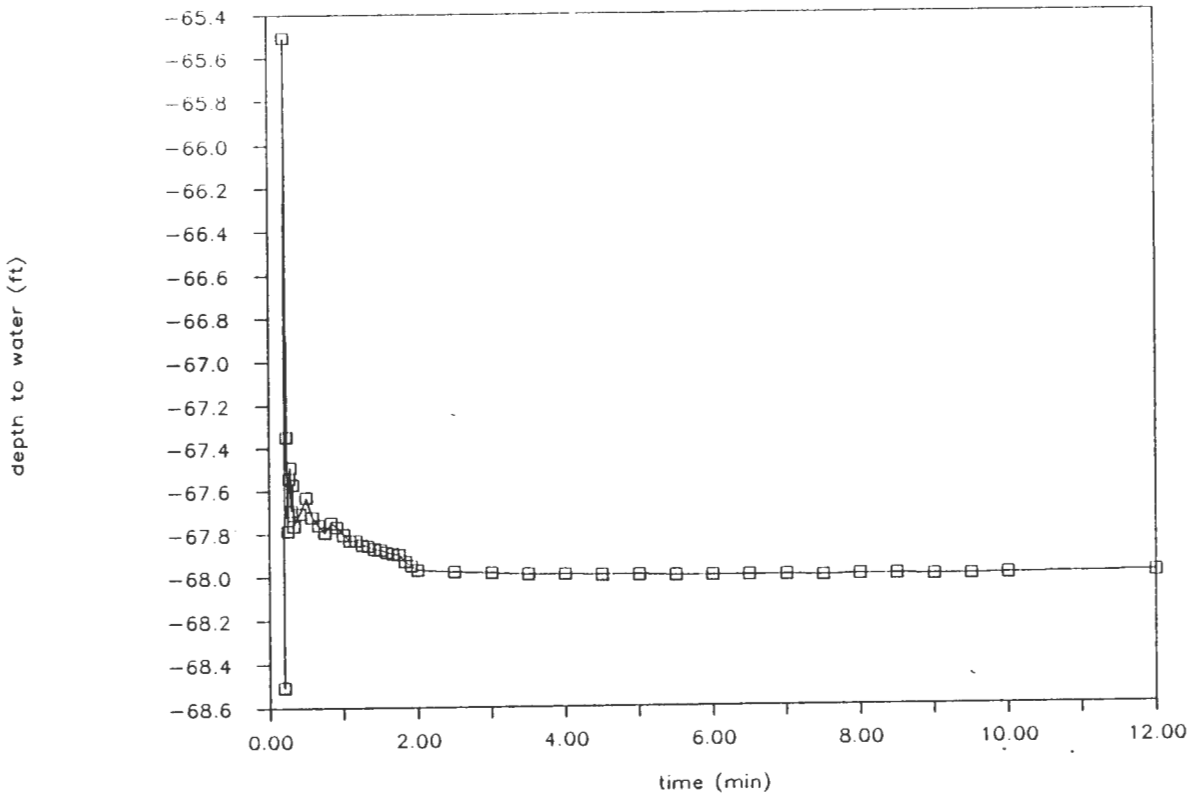
WELL N-72 SLUG WITHDRAWAL

p. 6 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.6666	0.0111	68.044	-68.044	0.034	0.0227
0.7500	0.0125	68.038	-68.038	0.028	0.0187
0.8333	0.0139	68.032	-68.032	0.022	0.0147
0.9166	0.0153	68.025	-68.025	0.015	0.0100
1.0000	0.0167	68.022	-68.022	0.012	0.0080
1.0833	0.0181	68.019	-68.019	0.009	0.0060
1.1666	0.0194	68.019	-68.019	0.009	0.0060
1.2500	0.0208	68.016	-68.016	0.006	0.0040
1.3333	0.0222	68.016	-68.016	0.006	0.0040
1.4166	0.0236	68.016	-68.016	0.006	0.0040
1.5000	0.0250	68.016	-68.016	0.006	0.0040
1.5833	0.0264	68.016	-68.016	0.006	0.0040
1.6666	0.0278	68.013	-68.013	0.003	0.0020
1.7500	0.0292	68.013	-68.013	0.003	0.0020
1.8333	0.0306	68.016	-68.016	0.006	0.0040
1.9166	0.0319	68.013	-68.013	0.003	0.0020
2.0000	0.0333	68.016	-68.016	0.006	0.0040
2.5000	0.0417	68.013	-68.013	0.003	0.0020
3.0000	0.0500	68.013	-68.013	0.003	0.0020
3.5000	0.0583	68.013	-68.013	0.003	0.0020
4.0000	0.0667	68.013	-68.013	0.003	0.0020
4.5000	0.0750	68.010	-68.010	0	0.0000
5.0000	0.0833	68.010	-68.010	0	0.0000
5.5000	0.0917	68.010	-68.010	0	0.0000
6.0000	0.1000	68.010	-68.010	0	0.0000
6.5000	0.1083	68.013	-68.013	0.003	0.0020
7.0000	0.1167	68.013	-68.013	0.003	0.0020
7.5000	0.1250	68.013	-68.013	0.003	0.0020
8.0000	0.1333	68.013	-68.013	0.003	0.0020
8.5000	0.1417	68.013	-68.013	0.003	0.0020
9.0000	0.1500	68.016	-68.016	0.006	0.0040
9.5000	0.1583	68.016	-68.016	0.006	0.0040
10.0000	0.1667	68.016	-68.016	0.006	0.0040
12.0000	0.2000	68.016	-68.016	0.006	0.0040

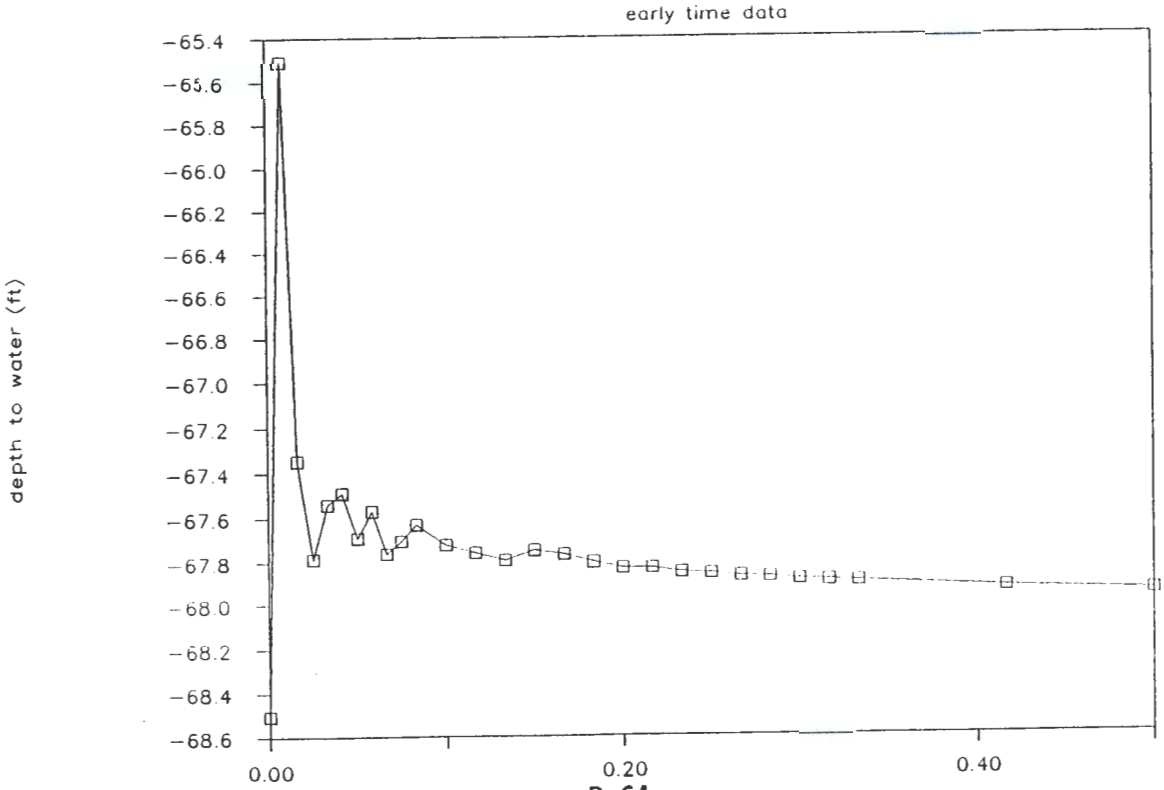
9413.1227.1196

Slug Injection – Well N-72

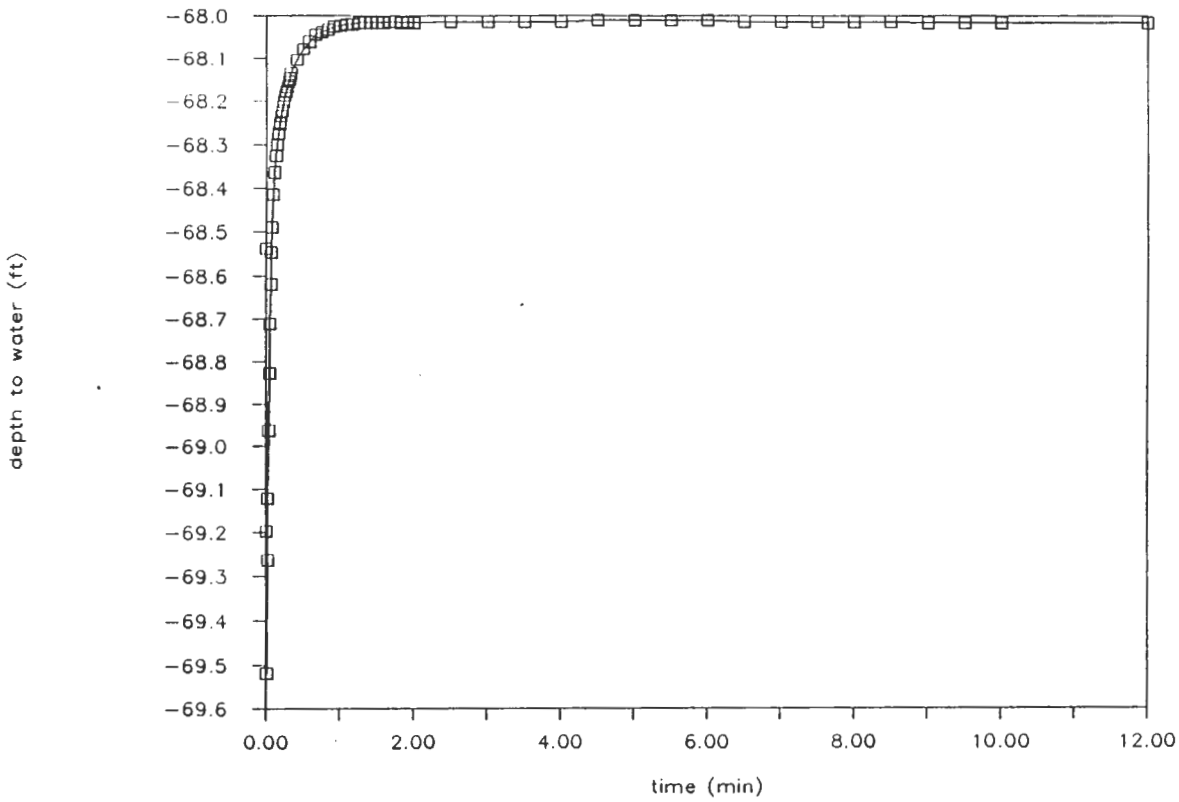


Slug Injection – Well N-72

early time data

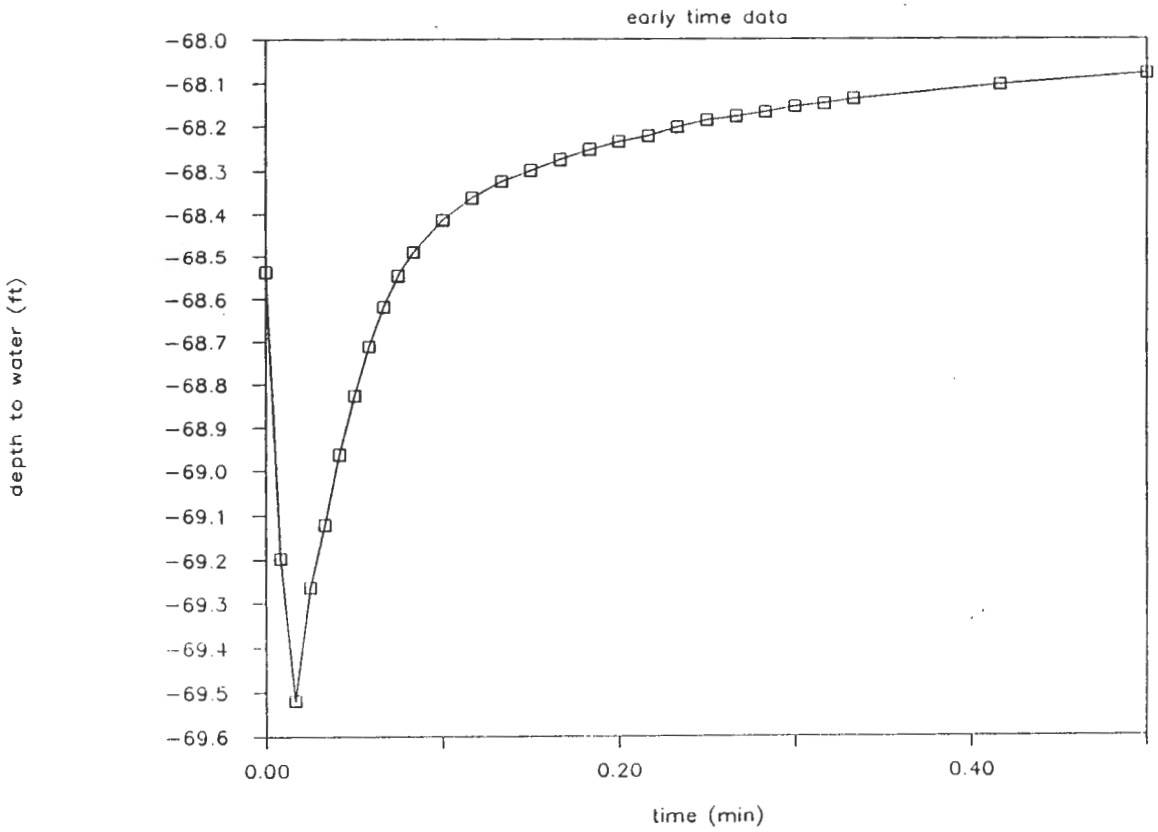


Slug Withdrawal – Well N-72



Slug Withdrawal – Well N-72

early time data



199-N-72 Slug Injection Calculations

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	20.3000	20.3000	40.0000

****

L_e/r_w = 60.9609600
A= 3.3572380
B= 5.576612E-001
C= 3.0301940
SANDPACK POROSITY= 3.000000E-001
t (min)= 5.000000E-001
1/t= 2.0000000
Y_o= (ft) 3.900000E-001
Y_t= (ft) 6.000000E-002
$1/t \ln(Y_o/Y_t)$= 3.7436040
$\ln[(H-L_w)/r_w]$= 4.0802320
$\ln(r_e/r_w)$= 2.7776090

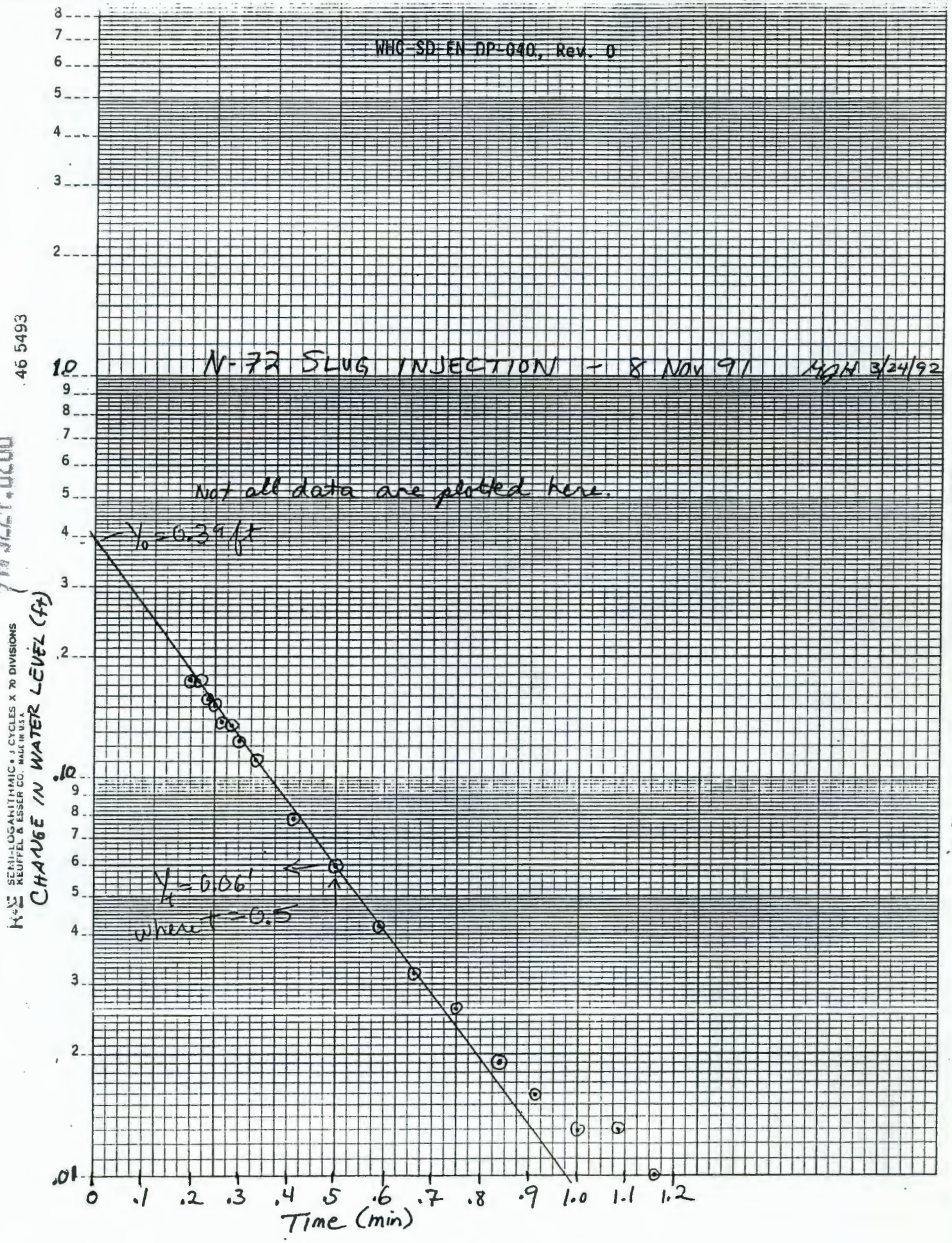
****

K (ft/day) = 19.4688800

****

T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 395.2182000

****


N-72 SLUG INJECTION - 8 NOV 91
MJH 3/24/92
Not all data are plotted here.
Y0 = 0.39 ft
Y1 = 0.06'
where t = 0.5
CHANGE IN WATER LEVEL (ft)
Time (min)
46 5493
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
9H3224.0200
98
.36
62

199-N-72 Slug Withdrawal Calculations -- early time

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	20.3000	20.3000	40.0000

****

L_e/r_w = 60.9609600
A= 3.3572380
B= 5.576612E-001
C= 3.0301940
SANDPACK POROSITY= 3.000000E-001
t (min)= 3.000000E-001
1/t= 3.3333330
Y_o= (ft) 1.7000000
Y_t= (ft) 2.000000E-002
$1/t \ln(Y_o/Y_t)$= 14.8088400
$\ln[(H-L_w)/r_w]$= 4.0802320
$\ln(r_e/r_w)$= 2.7776090

****

K (ft/day) = 77.0143900
This value probably represents the sand pack.

****

T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 1563.3920000
This value probably represents the sand pack.

****

199-N-72 Slug Withdrawal Calculations -- middle time

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	20.3000	20.3000	40.0000

****

L_e/r_w = 60.9609600
A= 3.3572380
B= 5.576612E-001
C= 3.0301940
SANDPACK POROSITY= 3.000000E-001
t (min)= 5.000000E-001
1/t= 2.0000000
Y_o= (ft) 5.000000E-001
Y_t= (ft) 6.600000E-002
$1/t \ln(Y_o/Y_t)$= 4.0499070
$\ln[(H-L_w)/r_w]$= 4.0802320
$\ln(r_e/r_w)$= 2.7776090

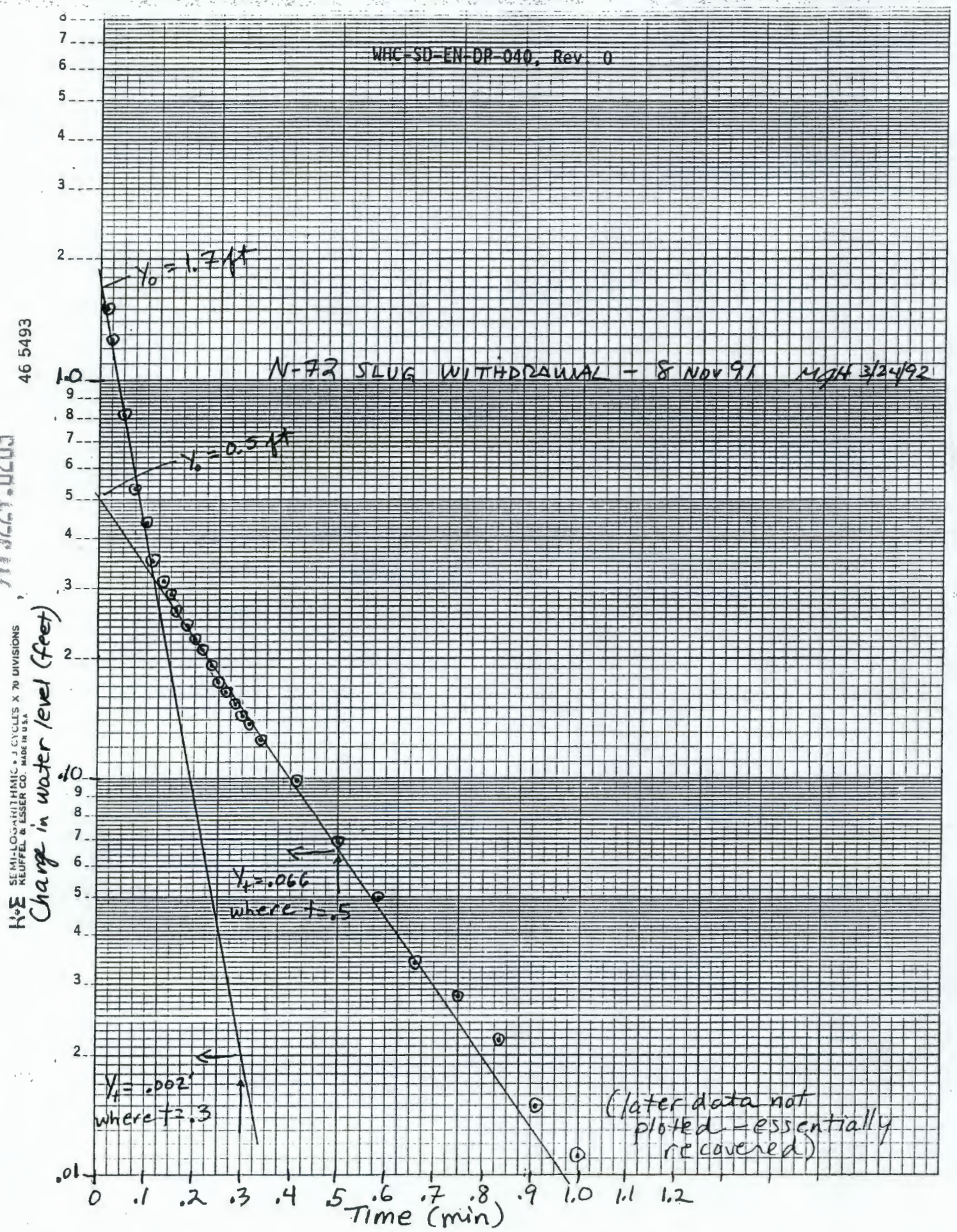
****

K (ft/day) = 21.0618200

****

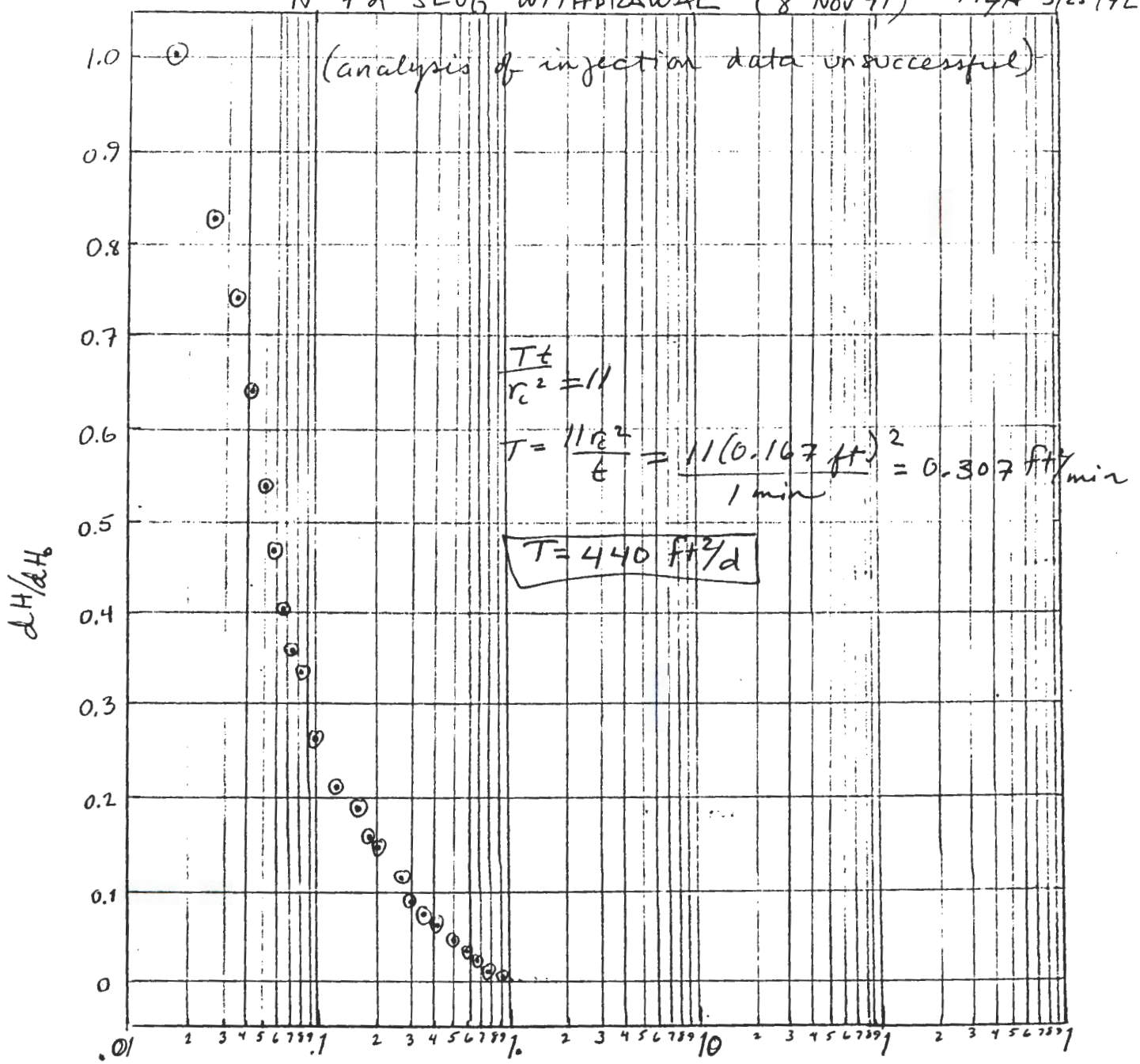
T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 427.5550000

****



9413224.0203

N-72 SLUG WITHDRAWAL (8 NOV 91) MGH 3/25/92



Best match is w/ "line source" curve.
1 min corresponds to 11 on type curve.

9413224.0205

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9413224.0206

WELL 199-N-73

AQUIFER TEST SUMMARY

WELL 199-N-73 DEVELOPMENT AND RECOVERY

Purpose of Tests: The well was pumped for development. Water levels were measured during drawdown and recovery for use in estimating aquifer transmissivity.

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 91.09 to 70.35 ft below top of casing; Water level at 73.13 ft below top of casing; tested thickness = 17.96 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in. (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 6 Nov 91 Start Time of Test: 10:39

Pumping Rate: Average discharge = 8.8 gal/min (1,700 ft^3/d)

Duration of Test: Discharge: 370 min (6.1 h); Recovery monitored for 10 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 8.7 ft

RESULTS: No estimates of aquifer properties were determined from the development tests.

Remarks:

Water levels began to fluctuate after about 20 min of pumping, and rose after 100 min of pumping. This is believed to be due to changing pumping rate.

Cooper and Jacob analysis was attempted; resulting T was 68 ft^2/d. However, borehole storage effects were probably dominant during this time (t_c = 15 min).

AQUIFER TEST SUMMARY

WELL 199-N-73 SLUG INJECTION AND WITHDRAWAL

Purpose of Tests: to estimate aquifer transmissivity or hydraulic conductivity

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 91.09 to 70.35 ft below top of casing; Water level at 73.13 ft below top of casing; tested thickness = 17.96 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in. (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 6 Nov 91 Start Time of Test: 17:43

Slugging Rod Dimension: 2-in-diameter by 6-ft length (0.13 ft^3)

Duration of Test: Injection: 10 min; Withdrawal: 10 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: -3.5 ft (see remarks)

RESULTS:

Methods	Transmissivity* (ft^2/d)	Hydraulic Conductivity (ft/d)	Storativity
Bouwer and Rice: Injection	106	5.9	Not determined
Bouwer and Rice: Withdrawal	170	9.5	Not determined

* Bouwer and Rice method estimates hydraulic conductivity; Cooper et al. estimates transmissivity. The other property was estimated by the equation T=Kb, where b = screened aquifer thickness.

Remarks:

Very early data (t<.1 min) showed extreme oscillations in water level above and below static. These data were not analyzed. Water levels recovered rapidly (approximately 2 min) after slug injection and withdrawal.

Bouwer and Rice analysis: Withdrawal data appear to illustrate a change in slope at around 0.1 min. The first data are believed to be indicative of the more permeable sand pack. Sand pack conductivity was calculated to be 73 ft/d.

Cooper et al. analysis: Data could not be matched to the Cooper type curves.

9413224.0209

DRAWDOWN/RECOVERY
WHC-SD-EN-DP-040, Rev. 0

Well Designation 199-N-73 Date 11/6/91

Well Depth 91.09' BTOC Screened Interval 91.09' - 70.35'

Pumping Method Constant Discharge

Equipment Used to Measure Water Level E. Tape/Transducer S.N. ET-5/262362 Calibration Due 1-24-92/5-9-92

Equipment Used to Measure Flow -NA- S.N. -NA- Calibration Due -NA-

Measuring Point Top of casing (TOC) Pump Start Time 1023/1040 Pump Stop Time 1030/1653

Time		Water Level		Discharge
Date	Time	Reading Unit:	Water Level Unit:	Reading Unit:
				Bucket Method
				5 gal/34 sec 8.8 GPM
		see attached data		

Signature of Recorder James A. Coates Date 11/8/91

Sign and Print Name

A-6000-402 (03/90)

9413224.0210

WELL N-73 BASELINE

p2 of 8

SE2000
Environmental Logger
11/07 07:08

Unit# 192 Test 0

INPUT 1: Level (F) TOC

Reference	73.130
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/06 10:13:27

Time:min	D-T-W:Ft
0.0000	73.130
1.0000	73.130
2.0000	73.130
3.0000	73.133
4.0000	73.133
5.0000	73.133
6.0000	73.133
7.0000	73.133
8.0000	73.130
9.0000	73.130
10.0000	73.133
11.0000	73.133

9413224.0211

WELL N-73 DEVELOPMENT

p. 3 of 8

SE2000
Environmental Logger
11/07 07:05

Unit# 192 Test 1

INPUT 1: Level (F) TOC

Reference	73.130
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/06 10:39:53

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0	0.0000	72.965	-72.965	-0.165	-0.165
0.0083	0.0001	73.872	-73.872	0.742	0.735
0.0166	0.0003	73.461	-73.461	0.331	0.330
0.025	0.0004	73.654	-73.654	0.524	0.521
0.0333	0.0006	73.862	-73.862	0.732	0.725
0.0416	0.0007	73.831	-73.831	0.701	0.695
0.05	0.0008	73.935	-73.935	0.805	0.797
0.0583	0.0010	74.052	-74.052	0.922	0.911
0.0666	0.0011	74.08	-74.08	0.95	0.939
0.075	0.0013	74.168	-74.168	1.038	1.025
0.0833	0.0014	74.222	-74.222	1.092	1.077
0.1	0.0017	74.348	-74.348	1.218	1.199
0.1166	0.0019	74.468	-74.468	1.338	1.316
0.1333	0.0022	74.592	-74.592	1.462	1.435
0.15	0.0025	74.705	-74.705	1.575	1.544
0.1666	0.0028	74.819	-74.819	1.689	1.653
0.1833	0.0031	74.92	-74.92	1.79	1.750
0.2	0.0033	75.024	-75.024	1.894	1.849
0.2166	0.0036	75.125	-75.125	1.995	1.945
0.2333	0.0039	75.229	-75.229	2.099	2.044
0.25	0.0042	75.147	-75.147	2.017	1.966
0.2666	0.0044	75.337	-75.337	2.207	2.146
0.2833	0.0047	75.274	-75.274	2.144	2.087
0.3	0.0050	75.324	-75.324	2.194	2.134
0.3166	0.0053	75.302	-75.302	2.172	2.113
0.3333	0.0056	75.375	-75.375	2.245	2.182
0.4166	0.0069	75.438	-75.438	2.308	2.241

WELL N-73 DEVELOPMENT

p. 4 of 8

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0.5	0.0083	75.577	-75.577	2.447	2.372
0.5833	0.0097	75.757	-75.757	2.627	2.541
0.6666	0.0111	75.874	-75.874	2.744	2.650
0.75	0.0125	76.031	-76.031	2.901	2.796
0.8333	0.0139	76.142	-76.142	3.012	2.899
0.9166	0.0153	76.246	-76.246	3.116	2.995
1	0.0167	76.388	-76.388	3.258	3.125
1.0833	0.0181	76.47	-76.47	3.34	3.201
1.1666	0.0194	76.587	-76.587	3.457	3.308
1.25	0.0208	76.663	-76.663	3.533	3.377
1.3333	0.0222	76.783	-76.783	3.653	3.486
1.4166	0.0236	76.868	-76.868	3.738	3.563
1.5	0.0250	76.938	-76.938	3.808	3.627
1.5833	0.0264	77.01	-77.01	3.88	3.692
1.6666	0.0278	77.118	-77.118	3.988	3.789
1.75	0.0292	77.162	-77.162	4.032	3.829
1.8333	0.0306	77.266	-77.266	4.136	3.922
1.9166	0.0319	77.31	-77.31	4.18	3.962
2	0.0333	77.377	-77.377	4.247	4.022
2.5	0.0417	77.749	-77.749	4.619	4.352
3	0.0500	78.093	-78.093	4.963	4.655
3.5	0.0583	78.374	-78.374	5.244	4.900
4	0.0667	78.637	-78.637	5.507	5.128
4.5	0.0750	78.832	-78.832	5.702	5.296
5	0.0833	79.041	-79.041	5.911	5.474
5.5	0.0917	79.252	-79.252	6.122	5.654
6	0.1000	79.435	-79.435	6.305	5.808
6.5	0.1083	79.596	-79.596	6.466	5.943
7	0.1167	79.757	-79.757	6.627	6.078
7.5	0.1250	79.903	-79.903	6.773	6.200
8	0.1333	80.029	-80.029	6.899	6.304
8.5	0.1417	80.149	-80.149	7.019	6.403
9	0.1500	80.294	-80.294	7.164	6.522
9.5	0.1583	80.417	-80.417	7.287	6.623
10	0.1667	80.512	-80.512	7.382	6.701
12	0.2000	80.777	-80.777	7.647	6.916
14	0.2333	80.964	-80.964	7.834	7.067
16	0.2667	81.115	-81.115	7.985	7.188
18	0.3000	81.267	-81.267	8.137	7.309
20	0.3333	81.399	-81.399	8.269	7.414
22	0.3667	81.478	-81.478	8.348	7.477
24	0.4000	81.45	-81.45	8.32	7.455
26	0.4333	81.466	-81.466	8.336	7.467
28	0.4667	81.453	-81.453	8.323	7.457
30	0.5000	81.526	-81.526	8.396	7.515
32	0.5333	81.598	-81.598	8.468	7.572
34	0.5667	81.608	-81.608	8.478	7.580

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WELL N-73 DEVELOPMENT

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Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
36	0.6000	81.592	-81.592	8.462	7.567
38	0.6333	81.542	-81.542	8.412	7.527
40	0.6667	81.491	-81.491	8.361	7.487
42	0.7000	81.586	-81.586	8.456	7.562
44	0.7333	81.728	-81.728	8.598	7.674
46	0.7667	81.782	-81.782	8.652	7.716
48	0.8000	81.819	-81.819	8.689	7.745
50	0.8333	81.763	-81.763	8.633	7.701
52	0.8667	81.801	-81.801	8.671	7.731
54	0.9000	81.782	-81.782	8.652	7.716
56	0.9333	81.832	-81.832	8.702	7.755
58	0.9667	81.857	-81.857	8.727	7.775
60	1.0000	81.747	-81.747	8.617	7.689
62	1.0333	81.643	-81.643	8.513	7.607
64	1.0667	81.592	-81.592	8.462	7.567
66	1.1000	81.532	-81.532	8.402	7.520
68	1.1333	81.535	-81.535	8.405	7.522
70	1.1667	81.497	-81.497	8.367	7.492
72	1.2000	81.532	-81.532	8.402	7.520
74	1.2333	81.535	-81.535	8.405	7.522
76	1.2667	81.573	-81.573	8.443	7.552
78	1.3000	81.605	-81.605	8.475	7.577
80	1.3333	81.636	-81.636	8.506	7.602
82	1.3667	81.712	-81.712	8.582	7.661
84	1.4000	81.763	-81.763	8.633	7.701
86	1.4333	81.804	-81.804	8.674	7.734
88	1.4667	81.879	-81.879	8.749	7.792
90	1.5000	81.889	-81.889	8.759	7.800
92	1.5333	81.823	-81.823	8.693	7.748
94	1.5667	81.737	-81.737	8.607	7.681
96	1.6000	81.756	-81.756	8.626	7.696
98	1.6333	81.782	-81.782	8.652	7.716
100	1.6667	81.807	-81.807	8.677	7.736
105	1.7500	81.583	-81.583	8.453	7.560
110	1.8333	81.624	-81.624	8.494	7.592
115	1.9167	81.744	-81.744	8.614	7.686
120	2.0000	81.621	-81.621	8.491	7.590
125	2.0833	81.542	-81.542	8.412	7.527
130	2.1667	81.15	-81.15	8.02	7.216
135	2.2500	80.882	-80.882	7.752	7.001
140	2.3333	80.733	-80.733	7.603	6.880
145	2.4167	80.822	-80.822	7.692	6.952
150	2.5000	80.885	-80.885	7.755	7.003
155	2.5833	80.645	-80.645	7.515	6.809
160	2.6667	80.632	-80.632	7.502	6.798
165	2.7500	80.383	-80.383	7.253	6.595
170	2.8333	80.367	-80.367	7.237	6.582

WELL N-73 DEVELOPMENT

p. 6 of 8

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
175	2.9167	80.001	-80.001	6.871	6.281
180	3.0000	79.751	-79.751	6.621	6.073
185	3.0833	79.183	-79.183	6.053	5.595
190	3.1667	78.76	-78.76	5.63	5.234
195	3.2500	78.608	-78.608	5.478	5.103
200	3.3333	78.659	-78.659	5.529	5.147
205	3.4167	78.655	-78.655	5.525	5.143
210	3.5000	78.652	-78.652	5.522	5.141
215	3.5833	78.561	-78.561	5.431	5.062
220	3.6667	78.652	-78.652	5.522	5.141
225	3.7500	78.371	-78.371	5.241	4.898
230	3.8333	78.024	-78.024	4.894	4.595
235	3.9167	77.421	-77.421	4.291	4.061
240	4.0000	77.534	-77.534	4.404	4.162
245	4.0833	77.768	-77.768	4.638	4.369
250	4.1667	77.917	-77.917	4.787	4.501
255	4.2500	77.996	-77.996	4.866	4.570
260	4.3333	78.1	-78.1	4.97	4.661
265	4.4167	78.1	-78.1	4.97	4.661
270	4.5000	78.128	-78.128	4.998	4.686
275	4.5833	78.074	-78.074	4.944	4.638
280	4.6667	78.134	-78.134	5.004	4.691
285	4.7500	78.15	-78.15	5.02	4.705
290	4.8333	78.204	-78.204	5.074	4.752
295	4.9167	78.242	-78.242	5.112	4.785
300	5.0000	78.201	-78.201	5.071	4.750
305	5.0833	78.27	-78.27	5.14	4.810
310	5.1667	78.299	-78.299	5.169	4.835
315	5.2500	78.324	-78.324	5.194	4.857
320	5.3333	78.359	-78.359	5.229	4.887
325	5.4167	78.355	-78.355	5.225	4.884
330	5.5000	78.359	-78.359	5.229	4.887
335	5.5833	78.34	-78.34	5.21	4.871
340	5.6667	78.337	-78.337	5.207	4.868
345	5.7500	78.374	-78.374	5.244	4.900
350	5.8333	78.374	-78.374	5.244	4.900
355	5.9167	78.349	-78.349	5.219	4.879
360	6.0000	78.327	-78.327	5.197	4.859
365	6.0833	78.346	-78.346	5.216	4.876
370	6.1667	78.314	-78.314	5.184	4.848

9413224.0215

WELL N-73 RECOVERY

p. 7 of 8

SE2000
Environmental Logger
11/07 07:04

Unit# 192 Test 2

INPUT 1: Level (F) TOC

Reference	73.130
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

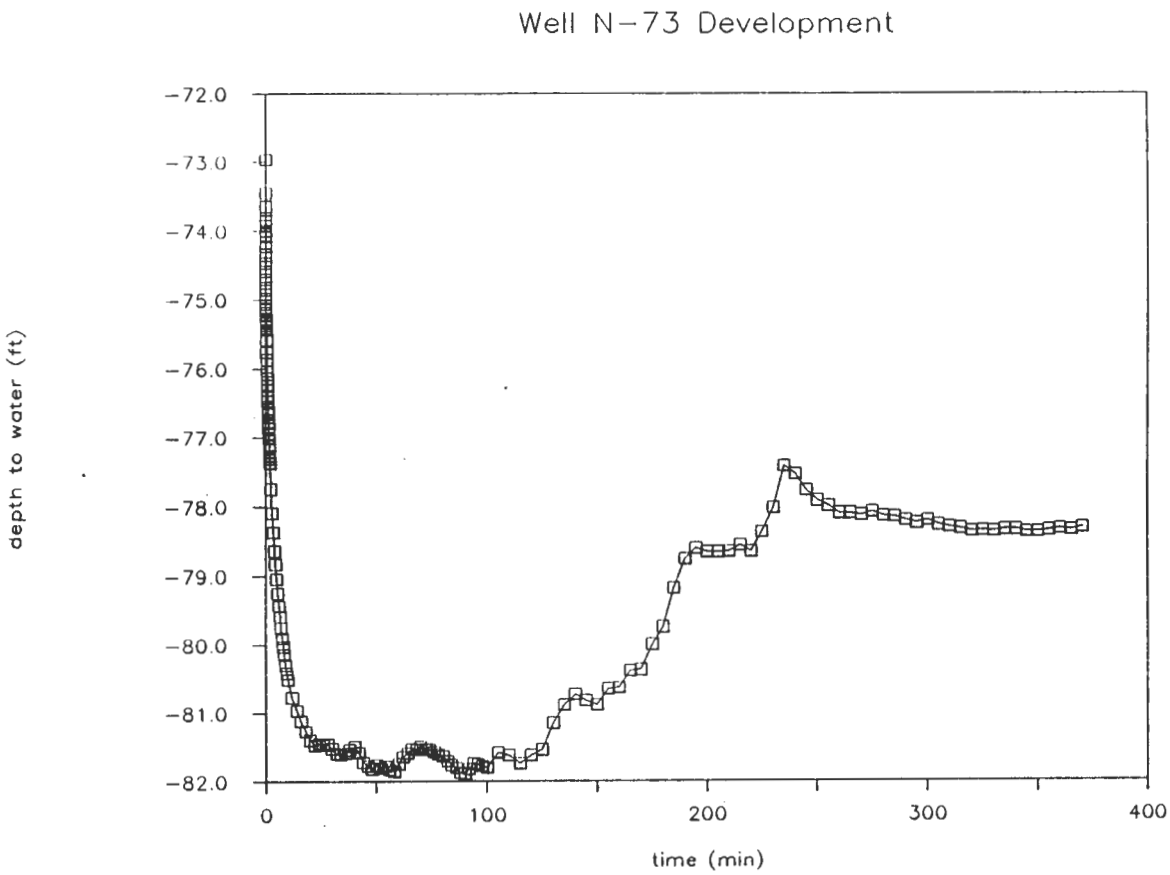
Step 0 11/06 16:58:11 tp=370 min

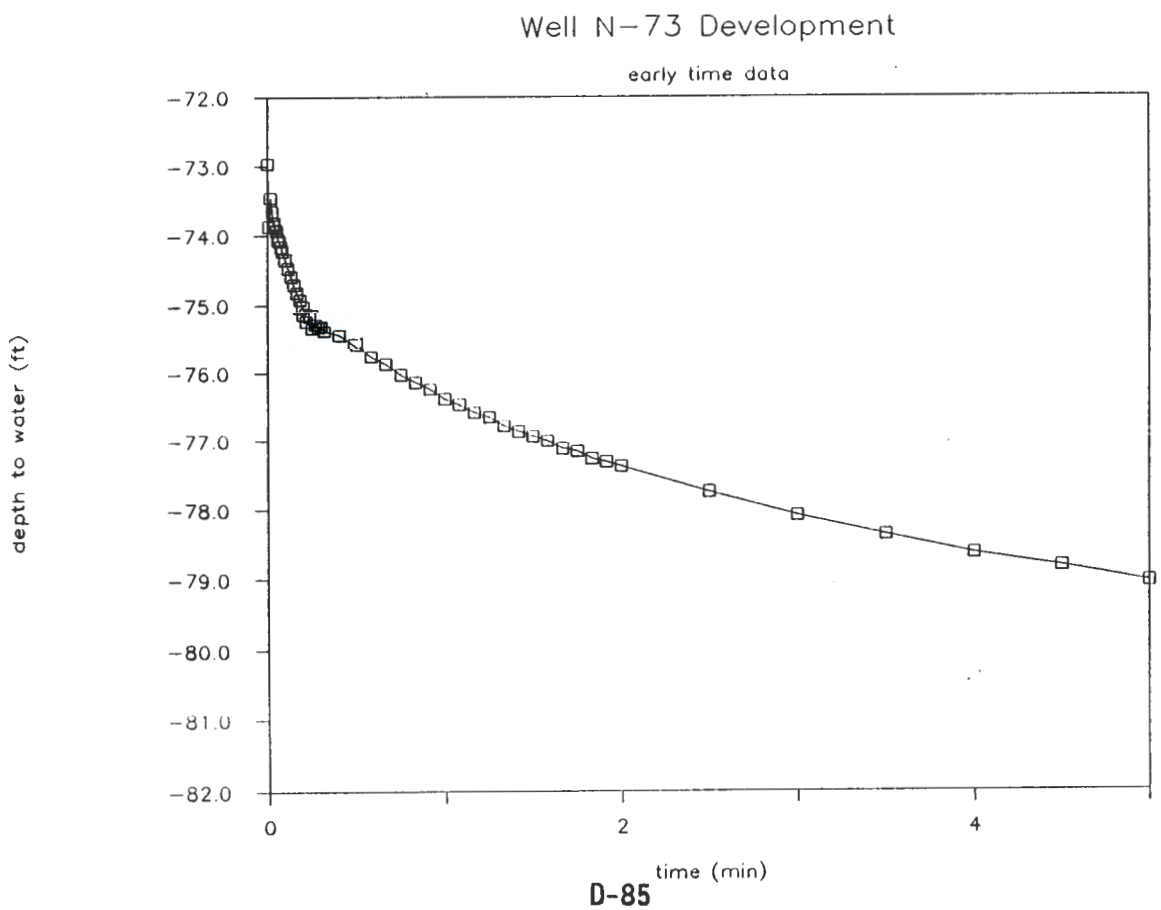
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0	0.0000	78.141	-78.141	5.011	4.697	
0.0083	0.0001	78.09	-78.09	4.96	4.652	44579
0.0166	0.0003	78.024	-78.024	4.894	4.595	22290
0.025	0.0004	77.958	-77.958	4.828	4.537	14801
0.0333	0.0006	77.879	-77.879	4.749	4.467	11112
0.0416	0.0007	77.828	-77.828	4.698	4.422	8895
0.05	0.0008	77.765	-77.765	4.635	4.366	7401
0.0583	0.0010	77.702	-77.702	4.572	4.311	6347
0.0666	0.0011	77.639	-77.639	4.509	4.255	5557
0.075	0.0013	77.582	-77.582	4.452	4.204	4934
0.0833	0.0014	77.522	-77.522	4.392	4.151	4443
0.1	0.0017	77.411	-77.411	4.281	4.052	3701
0.1166	0.0019	77.304	-77.304	4.174	3.956	3174
0.1333	0.0022	77.203	-77.203	4.073	3.866	2777
0.15	0.0025	77.102	-77.102	3.972	3.775	2468
0.1666	0.0028	77.004	-77.004	3.874	3.686	2222
0.1833	0.0031	76.909	-76.909	3.779	3.600	2020
0.2	0.0033	76.815	-76.815	3.685	3.515	1851
0.2166	0.0036	76.723	-76.723	3.593	3.432	1709
0.2333	0.0039	76.635	-76.635	3.505	3.351	1587
0.25	0.0042	76.552	-76.552	3.422	3.276	1481
0.2666	0.0044	76.47	-76.47	3.34	3.201	1389
0.2833	0.0047	76.391	-76.391	3.261	3.128	1307
0.3	0.0050	76.309	-76.309	3.179	3.053	1234
0.3166	0.0053	76.234	-76.234	3.104	2.984	1170
0.3333	0.0056	76.161	-76.161	3.031	2.916	1111
0.4166	0.0069	75.858	-75.858	2.728	2.635	889

WELL N-73 RECOVERY

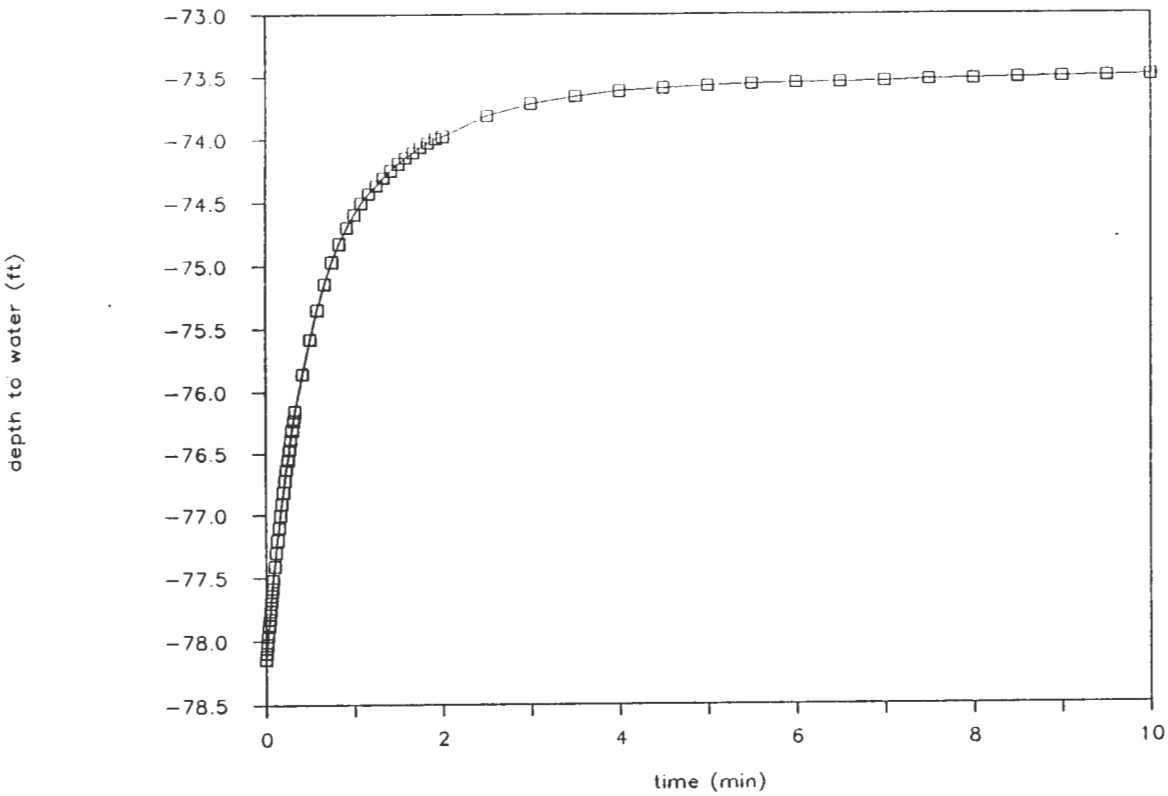
p. 8 of 8

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.5	0.0083	75.583	-75.583	2.453	2.378	741
0.5833	0.0097	75.346	-75.346	2.216	2.155	635
0.6666	0.0111	75.144	-75.144	2.014	1.963	556
0.75	0.0125	74.97	-74.97	1.84	1.798	494
0.8333	0.0139	74.825	-74.825	1.695	1.659	445
0.9166	0.0153	74.699	-74.699	1.569	1.538	405
1	0.0167	74.595	-74.595	1.465	1.438	371
1.0833	0.0181	74.506	-74.506	1.376	1.352	343
1.1666	0.0194	74.434	-74.434	1.304	1.283	318
1.25	0.0208	74.367	-74.367	1.237	1.218	297
1.3333	0.0222	74.304	-74.304	1.174	1.157	279
1.4166	0.0236	74.247	-74.247	1.117	1.101	262
1.5	0.0250	74.194	-74.194	1.064	1.050	248
1.5833	0.0264	74.146	-74.146	1.016	1.003	235
1.6666	0.0278	74.105	-74.105	0.975	0.963	223
1.75	0.0292	74.064	-74.064	0.934	0.923	212
1.8333	0.0306	74.029	-74.029	0.899	0.889	203
1.9166	0.0319	73.995	-73.995	0.865	0.856	194
2	0.0333	73.976	-73.976	0.846	0.837	186
2.5	0.0417	73.812	-73.812	0.682	0.676	149
3	0.0500	73.714	-73.714	0.584	0.580	124
3.5	0.0583	73.657	-73.657	0.527	0.524	107
4	0.0667	73.616	-73.616	0.486	0.483	94
4.5	0.0750	73.591	-73.591	0.461	0.458	83
5	0.0833	73.575	-73.575	0.445	0.443	75
5.5	0.0917	73.559.	-73.559	0.429	0.427	68
6	0.1000	73.549	-73.549	0.419	0.417	63
6.5	0.1083	73.543	-73.543	0.413	0.411	58
7	0.1167	73.537	-73.537	0.407	0.405	54
7.5	0.1250	73.527	-73.527	0.397	0.395	50
8	0.1333	73.521	-73.521	0.391	0.389	47
8.5	0.1417	73.512	-73.512	0.382	0.380	45
9	0.1500	73.505	-73.505	0.375	0.373	42
9.5	0.1583	73.499	-73.499	0.369	0.367	40
10	0.1667	73.493	-73.493	0.363	0.361	38


Well N-73 Development
-72.0
-73.0
-74.0
-75.0
-76.0
-77.0
-78.0
-79.0
-80.0
-81.0
-82.0
depth to water (ft)
0
100
200
300
400
time (min)

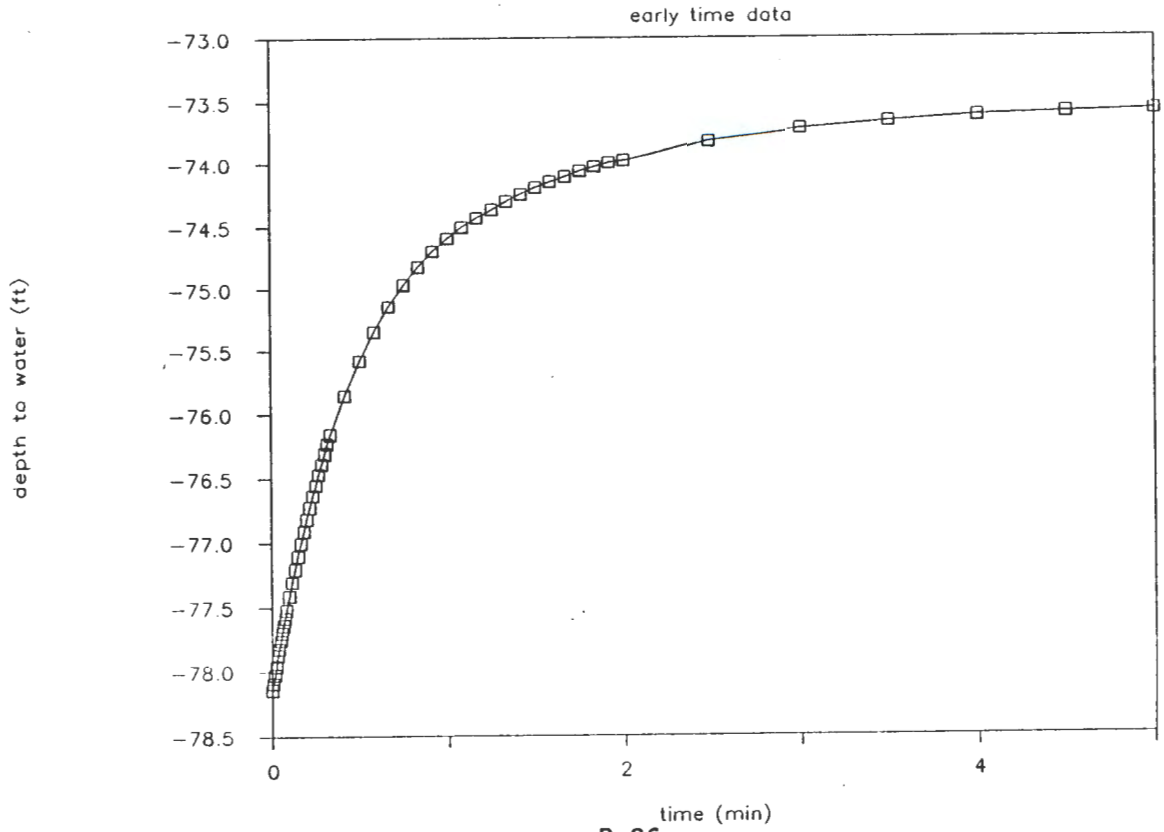

Well N-73 Development
early time data
-72.0
-73.0
-74.0
-75.0
-76.0
-77.0
-78.0
-79.0
-80.0
-81.0
-82.0
depth to water (ft)
0
2
4
time (min)

Well N-73 Recovery



Well N-73 Recovery

early time data



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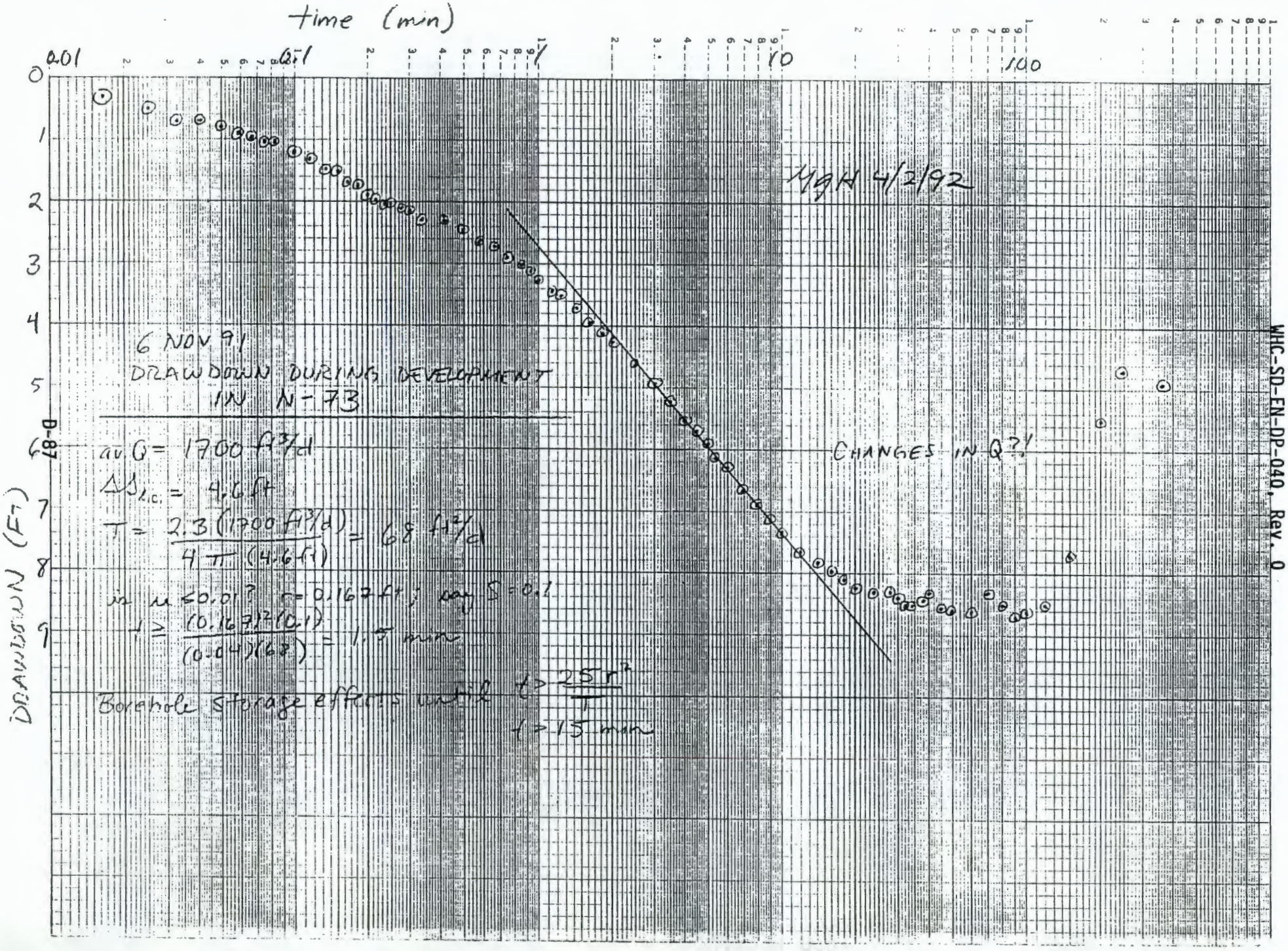


AQUIFER TEST SUMMARY

WELL 199-N-73 SLUG INJECTION AND WITHDRAWAL

Purpose of Tests: to estimate aquifer transmissivity or hydraulic conductivity

Hydrogeologic Unit Tested: The uppermost aquifer (Ringold Formation), comprising sand and gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 91.09 to 70.35 ft below top of casing; Water level at 73.13 ft below top of casing; tested thickness = 17.96 ft

Diameter of Well Casing: 4 in (0.333 ft)

Diameter of Well Screen: 4 in (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 6 Nov 91 Start Time of Test: 17:43

Slugging Rod Dimension: 2-in diameter by 6-ft length (0.13 ft^3)

Duration of Test: Injection: 10 min; Withdrawal: 10 min

Water-Level Measurement Methods: pressure transducer with data logger

Maximum Change in Water Level: -3.5 ft (see remarks)

RESULTS:

Methods	Transmissivity (ft^2/d)*	Hydraulic Conductivity (ft/d)	Storativity
Bouwer and Rice: Injection	106	5.9	Not determined
Bouwer and Rice: Withdrawal	170	9.5	Not determined

* Bouwer and Rice method estimates hydraulic conductivity; Cooper et al. estimates transmissivity. The other property was estimated by the equation T=Kb, where b = screened aquifer thickness.

Remarks:

Very early data (t<.1 min) showed extreme oscillations in water level above and below static. These data were not analyzed. Water levels recovered rapidly (appoximately 2 min) after slug injection and withdrawal.

Bouwer and Rice analysis: Withdrawal data appear to illustrate a change in slope at around 0.1 min. The first data are believed to be indicative of the more permeable sand pack. Sand pack conductivity was calculated to be 73 ft/d.

Cooper et al. analysis: Data could not be matched to the Cooper type curves.

BOREHOLE TEST INFORMATION

WHC-SD-EN-DP-040, Rev. 0

VALIDATED KDR 3/19/92 SIGNATURE/DATE

MJH 4/14/92

Borehole 199-N-73 Borehole Diameter 4" Hanford Coordinates —NA—

Interval Tested 91.09' - 70.35' Depth Interval 91.09' - 70.35'

Test Type Instaneous slug Injection/Withdrawal Borehole Depth 91.09' BTOC

Instruction Used WHC-CM-7-7-EII 10.1

EQUIPMENT

NAME	DESCRIPTION
ELECTRIC SOUNDER	SOUNST SN-
DATA LOGGER.	IN-SITU INC. S.N.-
PRESSURE TRANSDUCER	IN-SITU INC. S.N.-
SLUGGING ROD	
STEEL MEASURING TAPE	500' GRADUATED STEEL TAPE

MEASUREMENT DATUM

Control Datum TOP OF CASING 6" (T.O.C. 6")

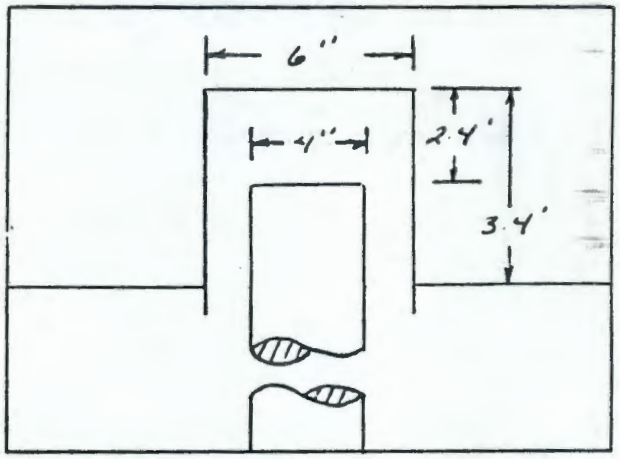
Elevation NA

Electric Sounder T.O.C. 6"

Steel Tape T.O.C. 6"

Pressure Transducer T.O.C. 6"

WELL HEAD DIAGRAM



COMMENTS

Recorded by: JAMES A. COATES JAMES A. COATES. 11/18/91

Sign and Print Name Date

BD-6000-295 (05/89)

9413224.0223

WHC-SD-EN-DP-040, Rev. 0

INSTANTANEOUS SLUG TEST DATA SHEET

—INJECTION

Page 1 of 4 JAC 6 4DH 4/14/92

Borehole 199-N-73

Interval Tested 91.09' - 70.35'

Depth to Water 73.13

Date 11/6/91

Measured by James Coates

Slug Volume .13 ft³ Barometer Reading (Beginning) -NA- (End) -NA-

Time 1730- injection baseline, 1745- injection

Transducer Measurement Units Feet

Depth to Transducer 13.845' BWL

Initial Pressure (P_i) 71.582

Slug Level or Pressure (P_{max}) 70.231

Borehole Diameter 4"

Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement
		SEE ATTACHED			SEE ATTACHED			

Recorded by James A. Coates James A. Coates (Sign and Print Name) 11/18/91 (Date)

BD-6000-293 (07/90)

9413224.0224

WELL N-73 BASELINE FOR SLUG TESTS

SE2000
Environmental Logger
11/07 07:03

p. 2 of 6

Unit# 192 Test 3

INPUT 1: Level (F) TOC

Reference	73.130
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/06 17:31:33

Time:Min	D-T-W:Ft
0.0000	73.120
1.0000	73.073
2.0000	73.047
3.0000	73.032
4.0000	73.022
5.0000	73.013
6.0000	73.006
7.0000	73.000
8.0000	72.997
9.0000	72.994
10.0000	72.991
11.0000	72.987

9413224.0225

WELL N-73 SLUG INJECTION

p. 3 of 6

SE2000
Environmental Logger
11/07 07:01

Unit# 192 Test 4

INPUT 1: Level (F) TOC

Reference	73.130	
SG	1.000	
Linearity	0.000	
Scale factor	9.998	
Offset	0.000	vol. slugging rod = 0.13 ft3
Delay mSEC	50.000	theoretical d(Yo) = 1.5 ft

Step 0 11/06 17:43:24

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.0000	0.0000	71.582	-71.582	1.548	1.0320
0.0083	0.0001	70.231	-70.231	2.899	1.9327
0.0166	0.0003	76.691	-76.691	-3.561	-2.3740
0.0250	0.0004	73.489	-73.489	-0.359	-0.2393
0.0333	0.0006	71.238	-71.238	1.892	1.2613
0.0416	0.0007	73.126	-73.126	0.004	0.0027
0.0500	0.0008	73.095	-73.095	0.035	0.0233
0.0583	0.0010	72.504	-72.504	0.626	0.4173
0.0666	0.0011	72.959	-72.959	0.171	0.1140
0.0750	0.0013	72.533	-72.533	0.597	0.3980
0.0833	0.0014	72.735	-72.735	0.395	0.2633
0.1000	0.0017	72.687	-72.687	0.443	0.2953
0.1166	0.0019	72.643	-72.643	0.487	0.3247
0.1333	0.0022	72.650	-72.650	0.48	0.3200
0.1500	0.0025	72.738	-72.738	0.392	0.2613
0.1666	0.0028	72.751	-72.751	0.379	0.2527
0.1833	0.0031	72.735	-72.735	0.395	0.2633
0.2000	0.0033	72.741	-72.741	0.389	0.2593
0.2166	0.0036	72.747	-72.747	0.383	0.2553
0.2333	0.0039	72.760	-72.760	0.37	0.2467
0.2500	0.0042	72.770	-72.770	0.36	0.2400
0.2666	0.0044	72.776	-72.776	0.354	0.2360
0.2833	0.0047	72.782	-72.782	0.348	0.2320
0.3000	0.0050	72.792	-72.792	0.338	0.2253
0.3166	0.0053	72.798	-72.798	0.332	0.2213
0.3333	0.0056	72.804	-72.804	0.326	0.2173
0.4166	0.0069	72.833	-72.833	0.297	0.1980
0.5000	0.0083	72.861	-72.861	0.269	0.1793

WELL N-73 SLUG INJECTION

p. 4 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.5833	0.0097	72.886	-72.886	0.244	0.1627
0.6666	0.0111	72.912	-72.912	0.218	0.1453
0.7500	0.0125	72.931	-72.931	0.199	0.1327
0.8333	0.0139	72.950	-72.950	0.18	0.1200
0.9166	0.0153	72.965	-72.965	0.165	0.1100
1.0000	0.0167	72.978	-72.978	0.152	0.1013
1.0833	0.0181	72.994	-72.994	0.136	0.0907
1.1666	0.0194	73.003	-73.003	0.127	0.0847
1.2500	0.0208	73.013	-73.013	0.117	0.0780
1.3333	0.0222	73.025	-73.025	0.105	0.0700
1.4166	0.0236	73.032	-73.032	0.098	0.0653
1.5000	0.0250	73.041	-73.041	0.089	0.0593
1.5833	0.0264	73.047	-73.047	0.083	0.0553
1.6666	0.0278	73.054	-73.054	0.076	0.0507
1.7500	0.0292	73.057	-73.057	0.073	0.0487
1.8333	0.0306	73.063	-73.063	0.067	0.0447
1.9166	0.0319	73.066	-73.066	0.064	0.0427
2.0000	0.0333	73.070	-73.070	0.06	0.0400
2.5000	0.0417	73.085	-73.085	0.045	0.0300
3.0000	0.0500	73.095	-73.095	0.035	0.0233
3.5000	0.0583	73.101	-73.101	0.029	0.0193
4.0000	0.0667	73.104	-73.104	0.026	0.0173
4.5000	0.0750	73.104	-73.104	0.026	0.0173
5.0000	0.0833	73.107	-73.107	0.023	0.0153
5.5000	0.0917	73.107	-73.107	0.023	0.0153
6.0000	0.1000	73.107	-73.107	0.023	0.0153
6.5000	0.1083	73.107	-73.107	0.023	0.0153
7.0000	0.1167	73.104	-73.104	0.026	0.0173
7.5000	0.1250	73.104	-73.104	0.026	0.0173
8.0000	0.1333	73.104	-73.104	0.026	0.0173
8.5000	0.1417	73.104	-73.104	0.026	0.0173
9.0000	0.1500	73.104	-73.104	0.026	0.0173
9.5000	0.1583	73.101	-73.101	0.029	0.0193
10.0000	0.1667	73.101	-73.101	0.029	0.0193

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p. 5 of 6

WELL N-73 SLUG WITHDRAWAL

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)

SE2000
Environmental Logger
11/07 06:57

Unit# 192 Test 5

INPUT 1: Level (F) TOC

Reference	73.130	
SG	1.000	
Linearity	0.000	
Scale factor	9.998	vol. slugging rod = 0.13 ft3
Offset	0.000	theoretical d(Yo) = 1.5 ft
Delay mSEC	50.000	

Step 0 11/06 17:54:12

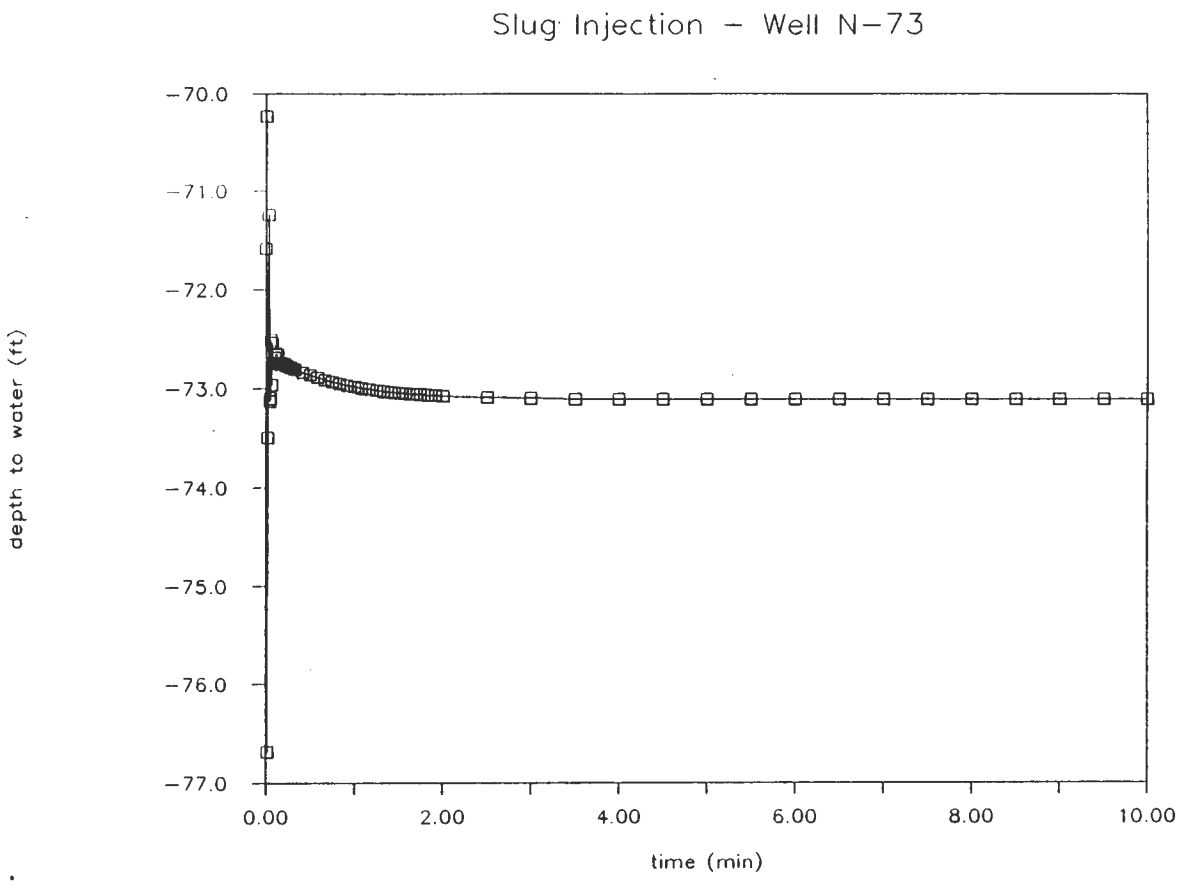
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0	0	75.305	-75.305	2.175	1.4500
0.0083	0.000138	75.059	-75.059	1.929	1.2860
0.0166	0.000276	74.844	-74.844	1.714	1.1427
0.025	0.000416	74.61	-74.61	1.48	0.9867
0.0333	0.000555	74.412	-74.412	1.282	0.8547
0.0416	0.000693	74.295	-74.295	1.165	0.7767
0.05	0.000833	74.197	-74.197	1.067	0.7113
0.0583	0.000971	74.105	-74.105	0.975	0.6500
0.0666	0.00111	74.026	-74.026	0.896	0.5973
0.075	0.00125	73.944	-73.944	0.814	0.5427
0.0833	0.001388	73.878	-73.878	0.748	0.4987
0.1	0.001666	73.789	-73.789	0.659	0.4393
0.1166	0.001943	73.723	-73.723	0.593	0.3953
0.1333	0.002221	73.682	-73.682	0.552	0.3680
0.15	0.0025	73.644	-73.644	0.514	0.3427
0.1666	0.002776	73.616	-73.616	0.486	0.3240
0.1833	0.003055	73.594	-73.594	0.464	0.3093
0.2	0.003333	73.575	-73.575	0.445	0.2967
0.2166	0.00361	73.553	-73.553	0.423	0.2820
0.2333	0.003888	73.537	-73.537	0.407	0.2713
0.25	0.004166	73.524	-73.524	0.394	0.2627
0.2666	0.004443	73.505	-73.505	0.375	0.2500
0.2833	0.004721	73.493	-73.493	0.363	0.2420
0.3	0.005	73.483	-73.483	0.353	0.2353
0.3166	0.005276	73.471	-73.471	0.341	0.2273
0.3333	0.005555	73.458	-73.458	0.328	0.2187
0.4166	0.006943	73.417	-73.417	0.287	0.1913
0.5	0.008333	73.376	-73.376	0.246	0.1640

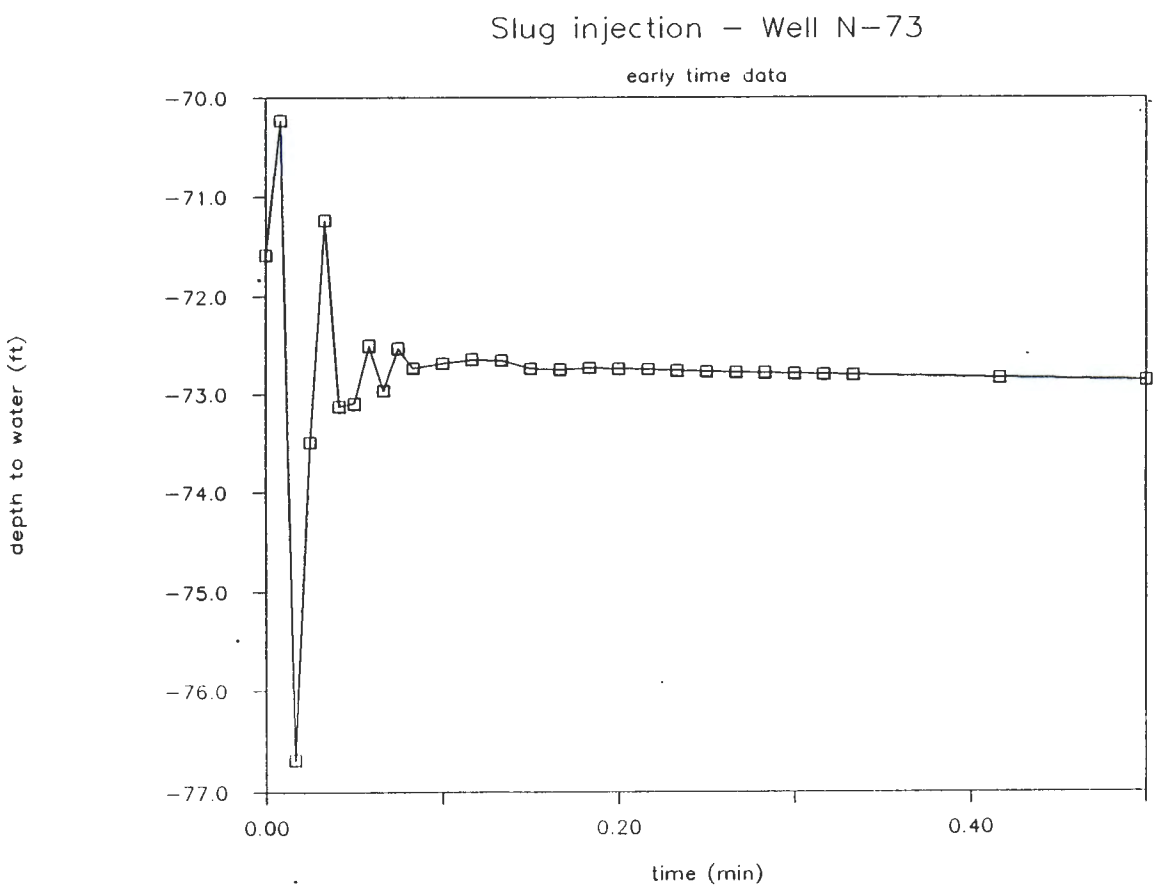
WELL N-73 SLUG WITHDRAWAL

p. 6 of 6

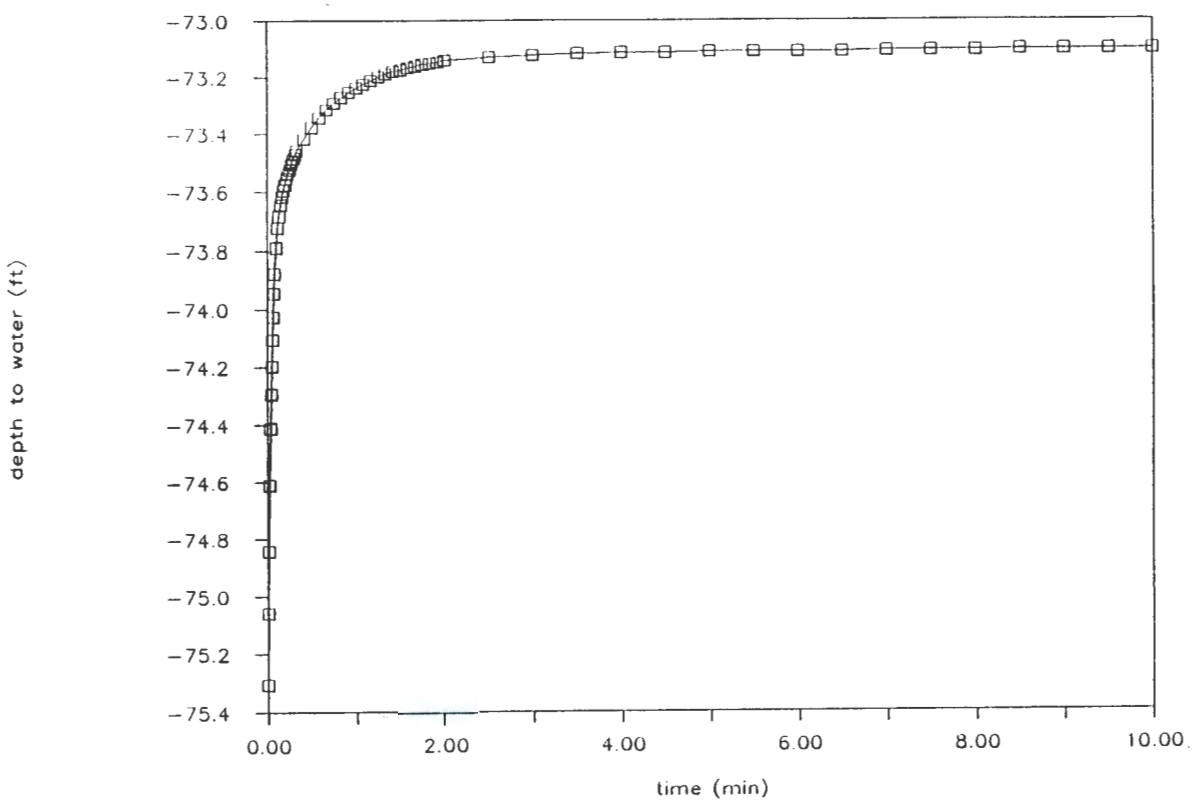
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.5833	0.009721	73.344	-73.344	0.214	0.1427
0.6666	0.01111	73.316	-73.316	0.186	0.1240
0.75	0.0125	73.291	-73.291	0.161	0.1073
0.8333	0.013888	73.272	-73.272	0.142	0.0947
0.9166	0.015276	73.253	-73.253	0.123	0.0820
1	0.016666	73.237	-73.237	0.107	0.0713
1.0833	0.018055	73.224	-73.224	0.094	0.0627
1.1666	0.019443	73.212	-73.212	0.082	0.0547
1.25	0.020833	73.199	-73.199	0.069	0.0460
1.3333	0.022221	73.189	-73.189	0.059	0.0393
1.4166	0.02361	73.18	-73.18	0.05	0.0333
1.5	0.025	73.174	-73.174	0.044	0.0293
1.5833	0.026388	73.167	-73.167	0.037	0.0247
1.6666	0.027776	73.161	-73.161	0.031	0.0207
1.75	0.029166	73.155	-73.155	0.025	0.0167
1.8333	0.030555	73.152	-73.152	0.022	0.0147
1.9166	0.031943	73.148	-73.148	0.018	0.0120
2	0.033333	73.142	-73.142	0.012	0.0080
2.5	0.041666	73.13	-73.13	0	0.0000
3	0.05	73.123	-73.123	-0.007	-0.0047
3.5	0.058333	73.117	-73.117	-0.013	-0.0087
4	0.066666	73.114	-73.114	-0.016	-0.0107
4.5	0.075	73.114	-73.114	-0.016	-0.0107
5	0.083333	73.111	-73.111	-0.019	-0.0127
5.5	0.091666	73.111	-73.111	-0.019	-0.0127
6	0.1	73.111	-73.111	-0.019	-0.0127
6.5	0.108333	73.111	-73.111	-0.019	-0.0127
7	0.116666	73.107	-73.107	-0.023	-0.0153
7.5	0.125	73.107	-73.107	-0.023	-0.0153
8	0.133333	73.107	-73.107	-0.023	-0.0153
8.5	0.141666	73.104	-73.104	-0.026	-0.0173
9	0.15	73.104	-73.104	-0.026	-0.0173
9.5	0.158333	73.104	-73.104	-0.026	-0.0173
10	0.166666	73.104	-73.104	-0.026	-0.0173

9413224.0229


Slug Injection – Well N–73
depth to water (ft)
–70.0
–71.0
–72.0
–73.0
–74.0
–75.0
–76.0
–77.0
0.00
2.00
4.00
6.00
8.00
10.00
time (min)

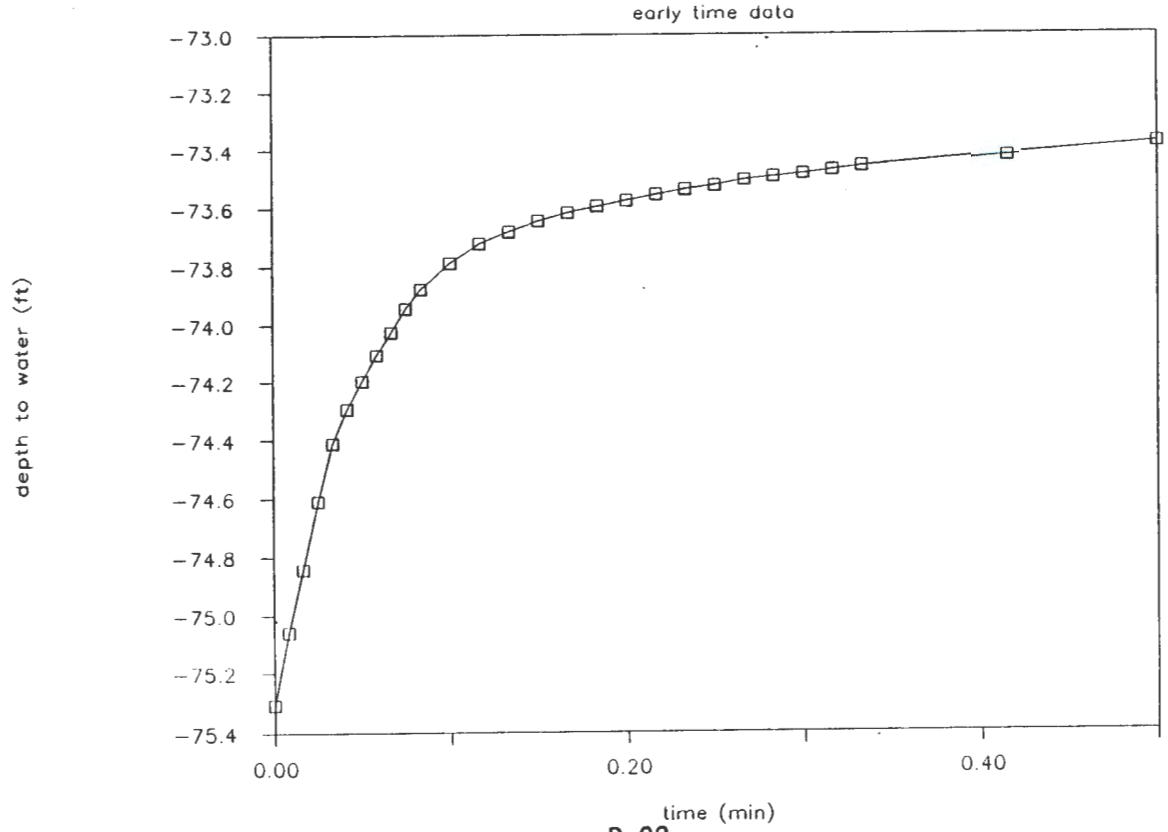

Slug injection – Well N–73
early time data
depth to water (ft)
–70.0
–71.0
–72.0
–73.0
–74.0
–75.0
–76.0
–77.0
0.00
0.20
0.40
time (min)

Slug Withdrawal – Well N-73



Slug Withdrawal – Well N-73

early time data



199-N-73 Slug Injection Calculations

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	18.0000	18.0000	40.0000

****

L_e/r_w = 54.0540500
A= 3.2102570
B= 5.289381E-001
C= 2.8551000
SANDPACK POROSITY= 3.000000E-001
t (min)= 1.0000000
1/t= 1.0000000
Y_o= (ft) 4.300000E-001
Y_t= (ft) 1.500000E-001
$1/t \ln(Y_o/Y_t)$= 1.0531500
$\ln[(H-L_w)/r_w]$= 4.1906550
$\ln(r_e/r_w)$= 2.6589590

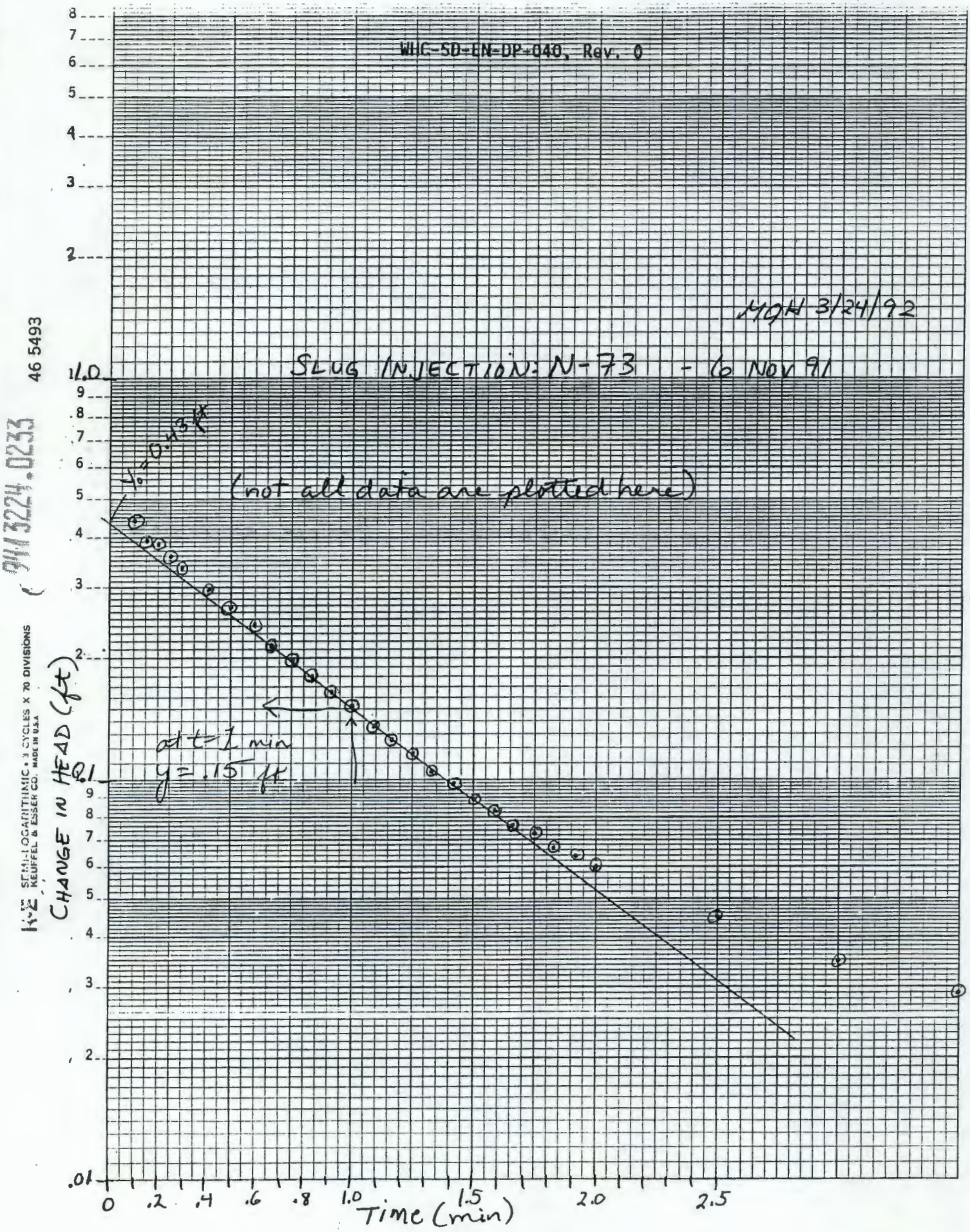
****

K (ft/day) = 5.9129620

****

T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 106.4333000

****


MGH 3/24/92
SLUG INJECTION: N-73 - 16 NOV 91
(not all data are plotted here)
y0 = 0.43 ft
at t=1 min
y=.15 ft
CHANGE IN HEAD (ft)
Time (min)
0
.2
.4
.6
.8
1.0
1.5
2.0
2.5
.01
.1
1.0
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5493
9413224.0233

199-N-73 Slug Withdrawal Calculations -- early time

****
THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	18.0000	18.0000	40.0000

****

L_e/r_w = 54.0540500
A= 3.2102570
B= 5.289381E-001
C= 2.8551000
SANDPACK POROSITY= 3.000000E-001
t (min)= 2.000000E-001
1/t= 5.0000000
Y_o= (ft) 2.0000000
Y_t= (ft) 2.000000E-001
$1/t \ln(Y_o/Y_t)$= 11.5129300
$\ln[(H-L_w)/r_w]$= 4.1906550
$\ln(r_e/r_w)$= 2.6589590

****
K (ft/day) = 64.6398900
This value probably represents the sand pack.
****
T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 1163.5180000
This value probably represents the sand pack.
****

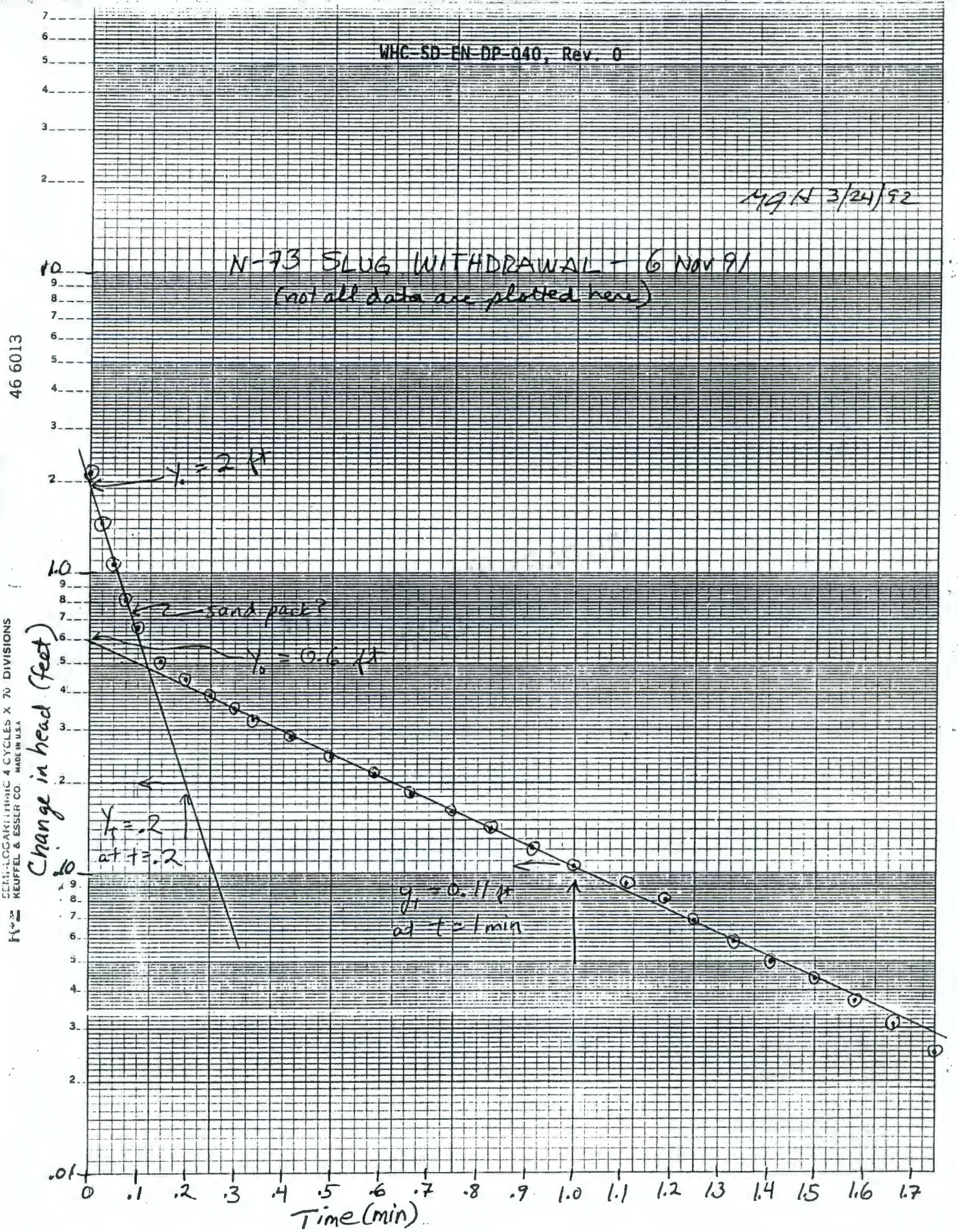
199-N-73 Slug Withdrawal Calculations -- Middle time

****
THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.
****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	18.0000	18.0000	40.0000

****
L_e/r_w = 54.0540500
A= 3.2102570
B= 5.289381E-001
C= 2.8551000
SANDPACK POROSITY= 3.000000E-001
t (min)= 1.0000000
1/t= 1.0000000
Y_o= (ft) 6.000000E-001
Y_t= (ft) 1.100000E-001
$1/t \ln(Y_o/Y_t)$= 1.6964490
$\ln[(H-L_w)/r_w]$= 4.1906550
$\ln(r_e/r_w)$= 2.6589590
****
K (ft/day) = 9.5247990
****
T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 171.4464000
****


MGH 3/24/92
N-73 SLUG WITHDRAWAL - 6 Nov 91
(not all data are plotted here)
$Y_i = 2$ ft
2 — sand pack?
$Y_0 = 0.6$ ft
$Y_f = .2$
at $t = .2$
$y_1 = 0.11$ ft
at $t = 1$ min
Change in head (feet)
Time (min)
46 6013
KEUFFEL & ESSER CO. MADE IN U.S.A.
SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS

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9413224.0238

WELL 199-N-74

AQUIFER TEST SUMMARY

WELL 199-N-74 DEVELOPMENT AND RECOVERY

Purpose of Tests: The well was pumped for development. Water levels were measured during drawdown and recovery for use in estimating aquifer transmissivity.

Hydrogeologic Unit Tested: The uppermost aquifer (Hanford formation), comprising primarily gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 84.12 to 63.12 ft below top of casing; Water level at 66.41 ft below top of casing; tested thickness = 17.71 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in. (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 4 Nov 91 Start Time of Test: 11:17

Pumping Rate: Average discharge = 12.4 gal/min (2,400 ft^3/d)

Duration of Test: Discharge: 24 min; Recovery monitored for 12 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 1.3 ft

RESULTS:

The maximum drawdown was essentially achieved during the first 0.2 min of pumping. The data could not be interpreted.

DRAWDOWN/RECOVERY

Well Designation 199-N-74 Date 11-4-91

Well Depth 84.12' BTOC Screened Interval 84.12'-63.12'

Pumping Method CONSTANT DISCHARGE

Equipment Used to Measure Water Level E.TAPE/TRANSDUCER S.N ET-5/2K192 Calibration Due 1-24-92/5-9-92

Equipment Used to Measure Flow —NA— S.N. —NA— Calibration Due —NA—

Measuring Point TOP OF CASING 6" (T.O.C. 6") Pump Start Time 1115 Pump Stop Time 1140

Time		Water Level		Discharge
Date	Time	Reading Unit:	Water Level Unit:	Reading Unit:
				BUCKET METHOD.
		SEE ATTACHED		

Signature of Recorder James A. Coates JAMES A. COATES Date 11/30/91

Sign and Print Name

A-6000-402 (03/90)

9113224.0240

WELL N-74 BASELINE

p. 2 of 6

SE2000
Environmental Logger
11/04 15:47

Unit# 192 Test 0

INPUT 1: Level (F) TOC

Reference	66.410
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/04 11:03:18

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft
0	0.0000	66.406	-66.406
1	0.0167	66.403	-66.403
2	0.0333	66.403	-66.403
3	0.0500	66.400	-66.400
4	0.0667	66.400	-66.400
5	0.0833	66.400	-66.400
6	0.1000	66.400	-66.400
7	0.1167	66.400	-66.400
8	0.1333	66.400	-66.400
9	0.1500	66.397	-66.397
10	0.1667	66.397	-66.397
11	0.1833	66.397	-66.397
12	0.2000	66.397	-66.397
13	0.2167	66.397	-66.397

WELL N-74 DEVELOPMENT

p. 3 of 6

SE2000
Environmental Logger
11/04 15:45

Unit# 192 Test 1

INPUT 1: Level (F) TOC

Reference	66.410
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/04 11:17:21

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0	0.0000	66.949	-66.949	0.539	0.535
0.0083	0.0001	66.567	-66.567	0.157	0.157
0.0166	0.0003	66.684	-66.684	0.274	0.273
0.025	0.0004	66.776	-66.776	0.366	0.364
0.0333	0.0006	66.889	-66.889	0.479	0.476
0.0416	0.0007	66.972	-66.972	0.562	0.558
0.05	0.0008	67.041	-67.041	0.631	0.626
0.0583	0.0010	67.101	-67.101	0.691	0.685
0.0666	0.0011	67.155	-67.155	0.745	0.738
0.075	0.0013	67.202	-67.202	0.792	0.784
0.0833	0.0014	67.24	-67.24	0.83	0.821
0.1	0.0017	67.309	-67.309	0.899	0.889
0.1166	0.0019	67.357	-67.357	0.947	0.936
0.1333	0.0022	67.404	-67.404	0.994	0.982
0.15	0.0025	67.436	-67.436	1.026	1.013
0.1666	0.0028	67.467	-67.467	1.057	1.043
0.1833	0.0031	67.483	-67.483	1.073	1.059
0.2	0.0033	67.502	-67.502	1.092	1.077
0.2166	0.0036	67.512	-67.512	1.102	1.087
0.2333	0.0039	67.524	-67.524	1.114	1.098
0.25	0.0042	67.505	-67.505	1.095	1.080
0.2666	0.0044	67.499	-67.499	1.089	1.074
0.2833	0.0047	67.483	-67.483	1.073	1.059
0.3	0.0050	67.474	-67.474	1.064	1.050
0.3166	0.0053	67.467	-67.467	1.057	1.043
0.3333	0.0056	67.464	-67.464	1.054	1.040
0.4166	0.0069	67.448	-67.448	1.038	1.025

WELL N-74 DEVELOPMENT

p. 4 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft
0.5	0.0083	67.452	-67.452	1.042	1.028
0.5833	0.0097	67.458	-67.458	1.048	1.034
0.6666	0.0111	67.464	-67.464	1.054	1.040
0.75	0.0125	67.47	-67.47	1.06	1.046
0.8333	0.0139	67.48	-67.48	1.07	1.056
0.9166	0.0153	67.483	-67.483	1.073	1.059
1	0.0167	67.496	-67.496	1.086	1.071
1.0833	0.0181	67.496	-67.496	1.086	1.071
1.1666	0.0194	67.505	-67.505	1.095	1.080
1.25	0.0208	67.508	-67.508	1.098	1.083
1.3333	0.0222	67.515	-67.515	1.105	1.090
1.4166	0.0236	67.515	-67.515	1.105	1.090
1.5	0.0250	67.518	-67.518	1.108	1.093
1.5833	0.0264	67.53	-67.53	1.12	1.104
1.6666	0.0278	67.527	-67.527	1.117	1.101
1.75	0.0292	67.534	-67.534	1.124	1.108
1.8333	0.0306	67.54	-67.54	1.13	1.114
1.9166	0.0319	67.537	-67.537	1.127	1.111
2	0.0333	67.543	-67.543	1.133	1.117
2.5	0.0417	67.556	-67.556	1.146	1.130
3	0.0500	67.568	-67.568	1.158	1.141
3.5	0.0583	67.568	-67.568	1.158	1.141
4	0.0667	67.556	-67.556	1.146	1.130
4.5	0.0750	67.575	-67.575	1.165	1.148
5	0.0833	67.587	-67.587	1.177	1.160
5.5	0.0917	67.6	-67.6	1.19	1.172
6	0.1000	67.619	-67.619	1.209	1.191
6.5	0.1083	67.632	-67.632	1.222	1.203
7	0.1167	67.644	-67.644	1.234	1.215
7.5	0.1250	67.654	-67.654	1.244	1.225
8	0.1333	67.66	-67.66	1.25	1.230
8.5	0.1417	67.666	-67.666	1.256	1.236
9	0.1500	67.666	-67.666	1.256	1.236
9.5	0.1583	67.673	-67.673	1.263	1.243
10	0.1667	67.676	-67.676	1.266	1.246
12	0.2000	67.685	-67.685	1.275	1.255
14	0.2333	67.695	-67.695	1.285	1.264
16	0.2667	67.701	-67.701	1.291	1.270
18	0.3000	67.701	-67.701	1.291	1.270
20	0.3333	67.701	-67.701	1.291	1.270
22	0.3667	67.707	-67.707	1.297	1.276
24	0.4000	67.71	-67.71	1.3	1.279

WELL N-74 RECOVERY

p. 5 of 6

SE2000
Environmental Logger
11/04 15:42

Unit# 192 Test 2

INPUT 1: Level (F) TOC

Reference	66.410
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

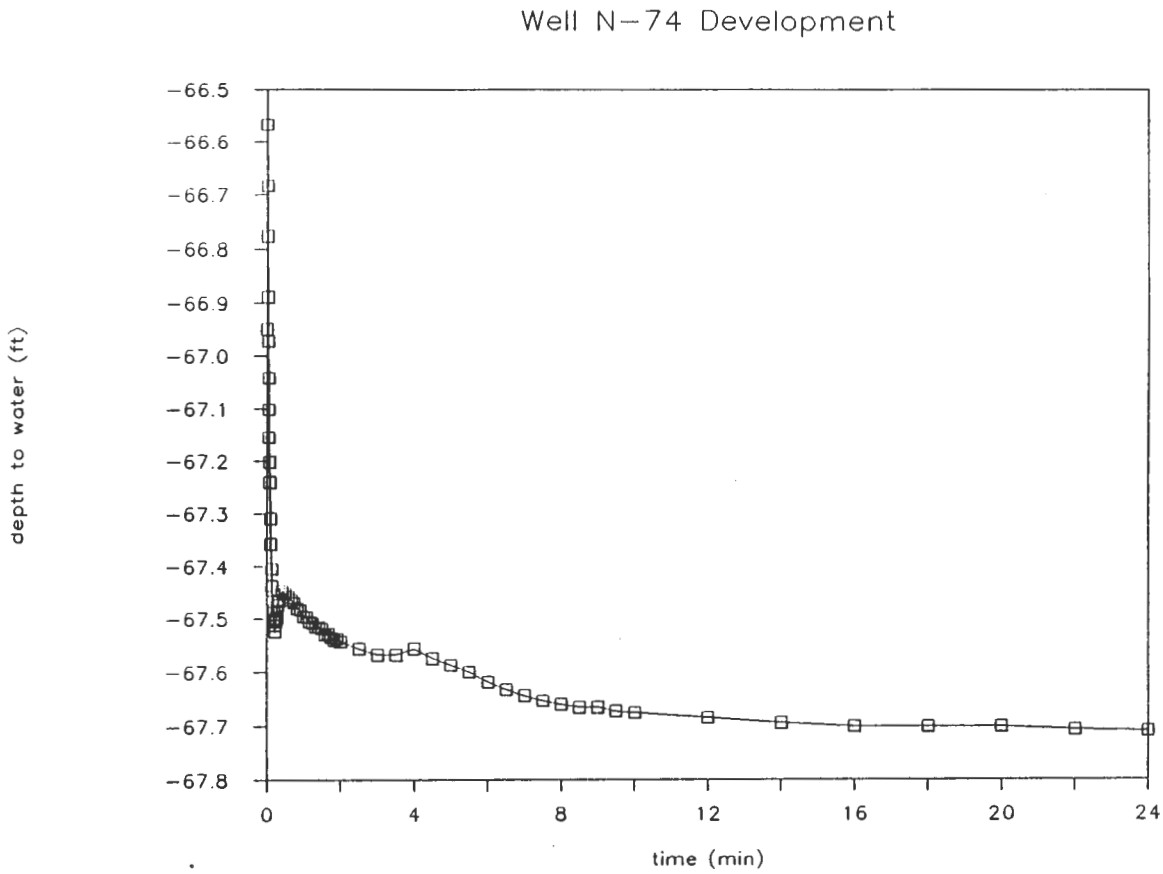
Step 0 11/04 11:42:27 tp=24 min

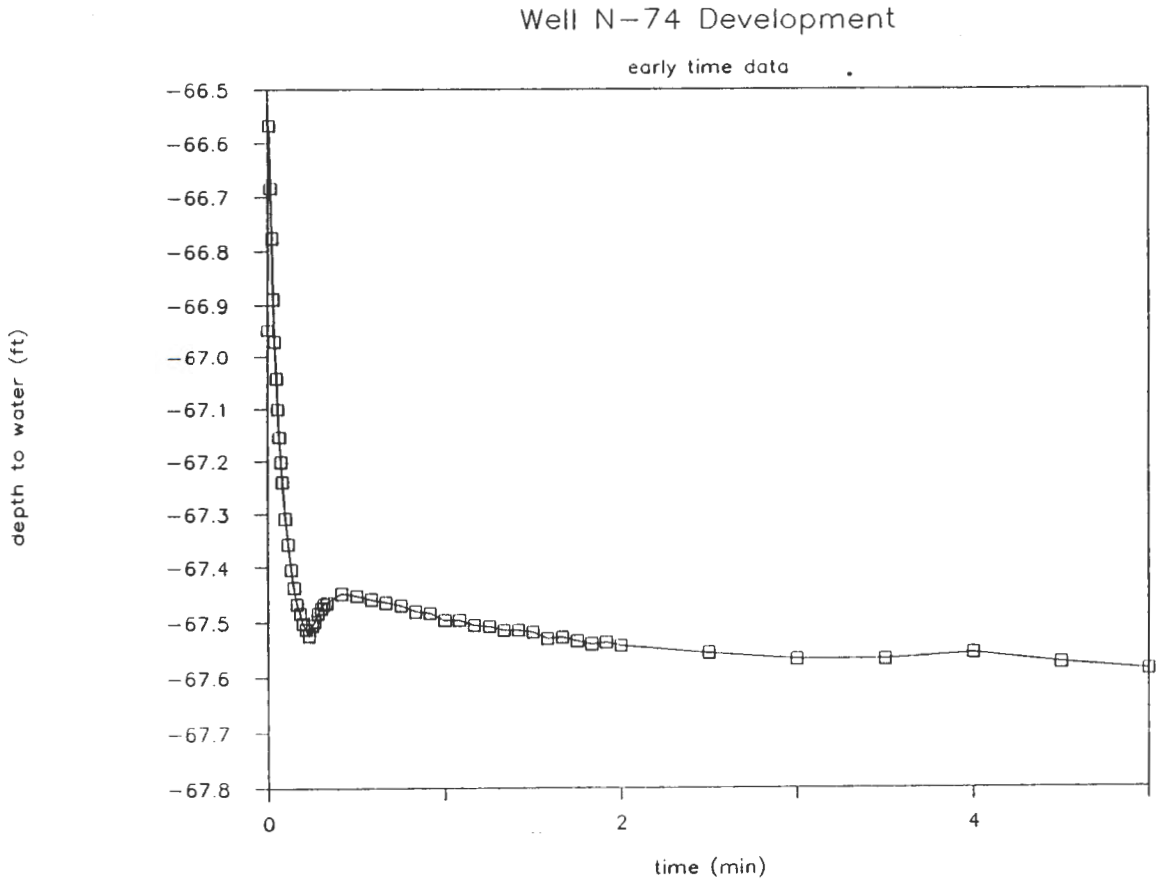
Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.0000	0.0000	67.299	-67.299	0.889	0.879	
0.0083	0.0001	67.185	-67.185	0.775	0.767	2892.57
0.0166	0.0003	67.084	-67.084	0.674	0.668	1446.78
0.0250	0.0004	67.008	-67.008	0.598	0.594	961.00
0.0333	0.0006	66.939	-66.939	0.529	0.526	721.72
0.0416	0.0007	66.891	-66.891	0.481	0.478	577.92
0.0500	0.0008	66.844	-66.844	0.434	0.432	481.00
0.0583	0.0010	66.806	-66.806	0.396	0.394	412.66
0.0666	0.0011	66.768	-66.768	0.358	0.356	361.36
0.0750	0.0013	66.740	-66.740	0.33	0.329	321.00
0.0833	0.0014	66.711	-66.711	0.301	0.300	289.12
0.1000	0.0017	66.667	-66.667	0.257	0.256	241.00
0.1166	0.0019	66.620	-66.620	0.21	0.209	206.83
0.1333	0.0022	66.585	-66.585	0.175	0.175	181.05
0.1500	0.0025	66.554	-66.554	0.144	0.144	161.00
0.1666	0.0028	66.528	-66.528	0.118	0.118	145.06
0.1833	0.0031	66.503	-66.503	0.093	0.093	131.93
0.2000	0.0033	66.481	-66.481	0.071	0.071	121.00
0.2166	0.0036	66.465	-66.465	0.055	0.055	111.80
0.2333	0.0039	66.449	-66.449	0.039	0.039	103.87
0.2500	0.0042	66.434	-66.434	0.024	0.024	97.00
0.2666	0.0044	66.421	-66.421	0.011	0.011	91.02
0.2833	0.0047	66.411	-66.411	0.001	0.001	85.72
0.3000	0.0050	66.402	-66.402	-0.008	-0.008	81.00
0.3166	0.0053	66.396	-66.396	-0.014	-0.014	76.81
0.3333	0.0056	66.393	-66.393	-0.017	-0.017	73.01
0.4166	0.0069	66.377	-66.377	-0.033	-0.033	58.61

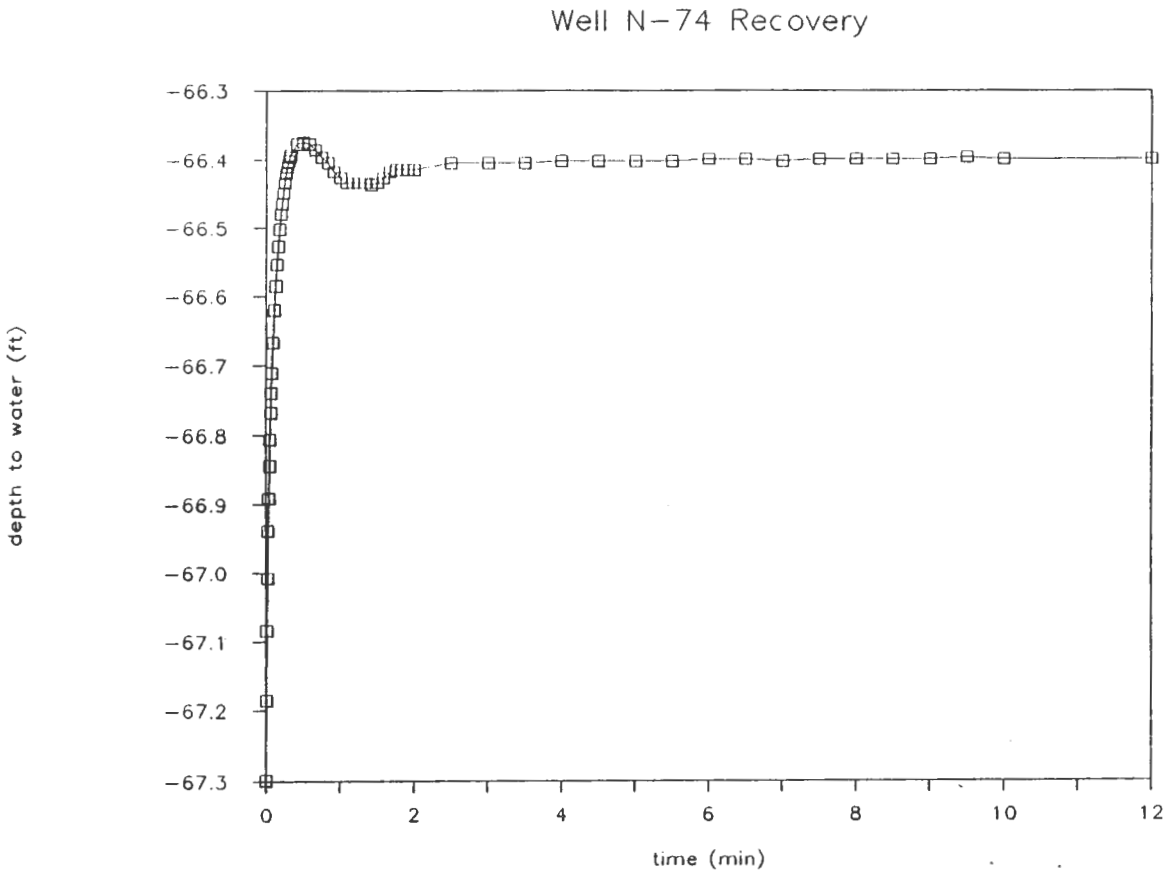
WELL N-74 RECOVERY

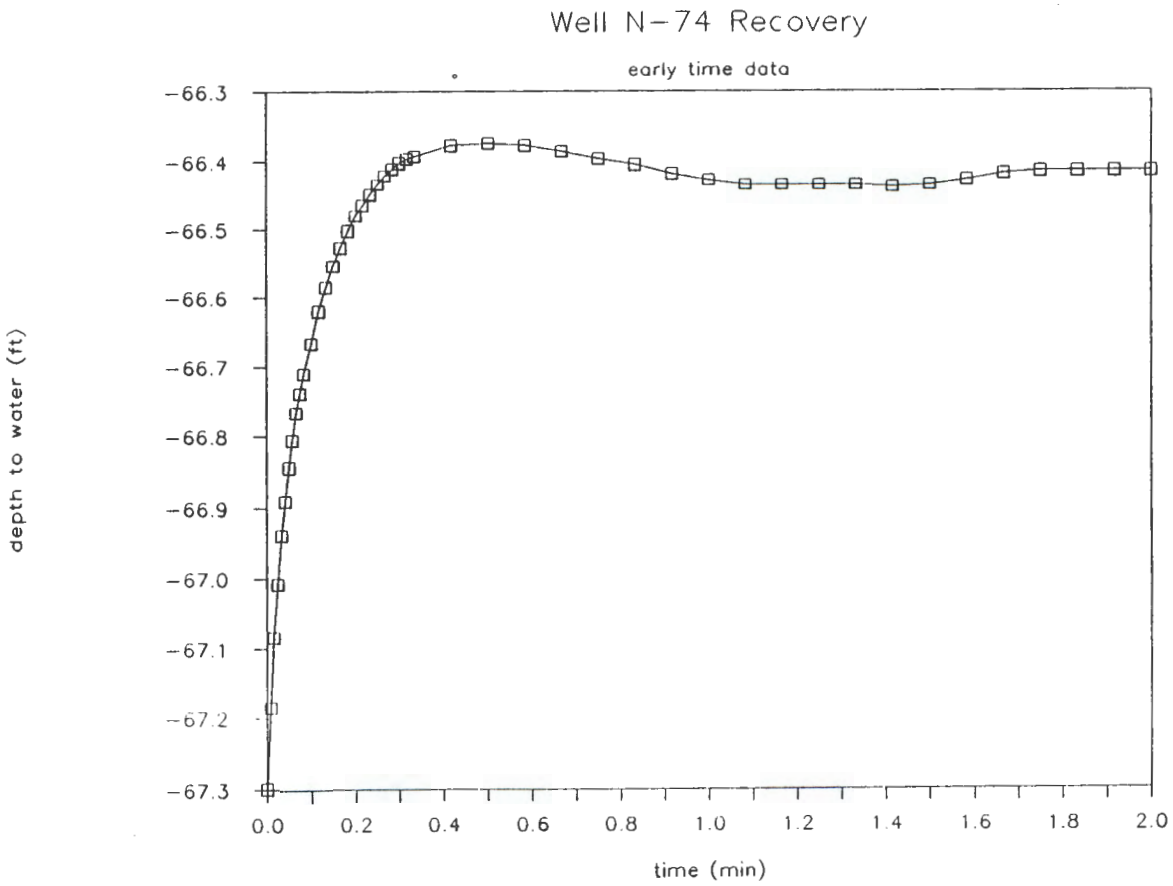
p. 6 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	Drawdown:Ft	Corrected Drawdown:Ft	(tr+tp)/tr
0.5000	0.0083	66.374	-66.374	-0.036	-0.036	49.00
0.5833	0.0097	66.377	-66.377	-0.033	-0.033	42.15
0.6666	0.0111	66.386	-66.386	-0.024	-0.024	37.00
0.7500	0.0125	66.396	-66.396	-0.014	-0.014	33.00
0.8333	0.0139	66.405	-66.405	-0.005	-0.005	29.80
0.9166	0.0153	66.418	-66.418	0.008	0.008	27.18
1.0000	0.0167	66.427	-66.427	0.017	0.017	25.00
1.0833	0.0181	66.434	-66.434	0.024	0.024	23.15
1.1666	0.0194	66.434	-66.434	0.024	0.024	21.57
1.2500	0.0208	66.434	-66.434	0.024	0.024	20.20
1.3333	0.0222	66.434	-66.434	0.024	0.024	19.00
1.4166	0.0236	66.437	-66.437	0.027	0.027	17.94
1.5000	0.0250	66.434	-66.434	0.024	0.024	17.00
1.5833	0.0264	66.427	-66.427	0.017	0.017	16.16
1.6666	0.0278	66.418	-66.418	0.008	0.008	15.40
1.7500	0.0292	66.415	-66.415	0.005	0.005	14.71
1.8333	0.0306	66.415	-66.415	0.005	0.005	14.09
1.9166	0.0319	66.415	-66.415	0.005	0.005	13.52
2.0000	0.0333	66.415	-66.415	0.005	0.005	13.00
2.5000	0.0417	66.405	-66.405	-0.005	-0.005	10.60
3.0000	0.0500	66.405	-66.405	-0.005	-0.005	9.00
3.5000	0.0583	66.405	-66.405	-0.005	-0.005	7.86
4.0000	0.0667	66.402	-66.402	-0.008	-0.008	7.00
4.5000	0.0750	66.402	-66.402	-0.008	-0.008	6.33
5.0000	0.0833	66.402	-66.402	-0.008	-0.008	5.80
5.5000	0.0917	66.402	-66.402	-0.008	-0.008	5.36
6.0000	0.1000	66.399	-66.399	-0.011	-0.011	5.00
6.5000	0.1083	66.399	-66.399	-0.011	-0.011	4.69
7.0000	0.1167	66.402	-66.402	-0.008	-0.008	4.43
7.5000	0.1250	66.399	-66.399	-0.011	-0.011	4.20
8.0000	0.1333	66.399	-66.399	-0.011	-0.011	4.00
8.5000	0.1417	66.399	-66.399	-0.011	-0.011	3.82
9.0000	0.1500	66.399	-66.399	-0.011	-0.011	3.67
9.5000	0.1583	66.396	-66.396	-0.014	-0.014	3.53
10.0000	0.1667	66.399	-66.399	-0.011	-0.011	3.40
12.0000	0.2000	66.399	-66.399	-0.011	-0.011	3.00


Well N-74 Development
depth to water (ft)
-66.5
-66.6
-66.7
-66.8
-66.9
-67.0
-67.1
-67.2
-67.3
-67.4
-67.5
-67.6
-67.7
-67.8
0
4
8
12
16
20
24
time (min)


Well N-74 Development
early time data
depth to water (ft)
-66.5
-66.6
-66.7
-66.8
-66.9
-67.0
-67.1
-67.2
-67.3
-67.4
-67.5
-67.6
-67.7
-67.8
0
2
4
time (min)


Well N-74 Recovery
depth to water (ft)
-66.3
-66.4
-66.5
-66.6
-66.7
-66.8
-66.9
-67.0
-67.1
-67.2
-67.3
0
2
4
6
8
10
12
time (min)


Well N-74 Recovery
early time data
depth to water (ft)
-66.3
-66.4
-66.5
-66.6
-66.7
-66.8
-66.9
-67.0
-67.1
-67.2
-67.3
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
time (min)

AQUIFER TEST SUMMARY

WELL 199-N-74 SLUG INJECTION AND WITHDRAWAL

Purpose of Tests: To estimate aquifer transmissivity or hydraulic conductivity

Hydrogeologic Unit Tested: The uppermost aquifer (Hanford formation), comprising mainly gravel

Thickness of Aquifer: 40 ft (estimated; borehole did not fully penetrate aquifer)

Depth of Screened or Open Interval Exposed to Aquifer During Test: Screened 84.12 to 63.12 ft below top of casing; Water level at 66.41 ft below top of casing; tested thickness = 17.71 ft

Diameter of Well Casing: 4 in. (0.333 ft)

Diameter of Well Screen: 4 in. (0.333 ft)

Diameter of Screen plus Sand Pack: 8 in. (0.667 ft)

Porosity of Sand Pack: 0.30 (estimated)

Observation Well(s) Used: None Distance from Pumping Well: N/A

Depth of Screened Interval of Observation Well: N/A

Date of Tests: 4 Nov 91 Start Time of Test: 12:24

Slugging Rod Dimension: 2-in-diameter by 6-ft length (0.13 ft^3)

Duration of Test: Injection: 12 min; Withdrawal: 10 min

Water-Level Measurement Methods: Pressure transducer with data logger

Maximum Change in Water Level: 2.3 ft (see remarks)

RESULTS: (Bouwer and Rice method)

Methods	Transmissivity (ft^2/d)*	Hydraulic Conductivity (ft/d)	Storativity
Injection	Not determined	Not determined	Not determined
Withdrawal	1700	96	Not determined

* Bouwer and Rice method estimates hydraulic conductivity; transmissivity was estimated by the equation T=Kb, where b = screened aquifer thickness.

Remarks:

Water levels recovered very rapidly (less than 0.5 min) after slug injection and withdrawal. The earliest data after slug injection (<0.2 min) oscillated significantly and were not analyzed. There were not enough data between the end of oscillations and recovery to analyze injection data. Withdrawal data were successfully analyzed by the Bouwer and Rice method. Data could not be matched to the Cooper et al. type curves.

9413274.0249

BOREHOLE TEST INFORMATION

VALIDATED KDR 2/19/92 SIGNATURE DATE

MJH 4/14/92

Borehole 199-N-74 Borehole Diameter 4" Hanford Coordinates — NA —

Interval Tested 84.12' - 63.42' Depth Interval 84.12' - 63.42'

Test Type Instantaneous Slug Test Injection / Withdrawal Borehole Depth 84.12'

Instruction Used WHC-CM-7-7-EII 10.1

EQUIPMENT

NAME	DESCRIPTION
ELECTRIC SOUNDER	SOUNST SN-ET-5
DATA LOGGER.	IN-SITU INC. SN.-2K192
PRESSURE TRANSDUCER	IN-SITU INC. S.N.-262362
SLUGGING ROD	2.0 x 6.0 0.13 ft^3
STEEL MEASURING TAPE	500' GRADUATED STEEL TAPE

MEASUREMENT DATUM

Control Datum TOP OF CASING 6" (T.O.C. 6")

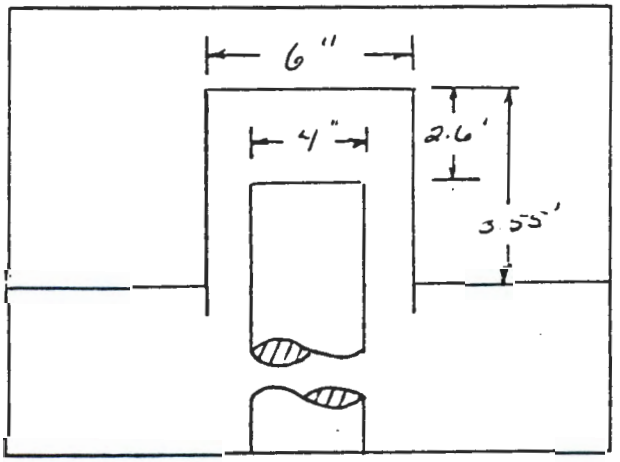
Elevation NA

Electric Sounder T.O.C. 6"

Steel Tape T.O.C. 6"

Pressure Transducer T.O.C. 6"

WELL HEAD DIAGRAM



COMMENTS

Recorded by: JAMES A. COATES JAMES A. COATES 11/22/91

Sign and Print Name Date

BD-6000-295 (05/89)

INSTANTANEOUS SLUG TEST DATA SHEET -INJECTION-

Borehole 199-N-74

Interval Tested 84.12' - 63.42'

Depth to Water 66.41' BTOC

Date 11/4/91

Measured by JAMES A. COATES

Slug Volume .134 ft³ Barometer Reading (Beginning) - NA - (End) - NA -

Time 1222-injection, 1210-injection baseline

Transducer Measurement Units FEET

Depth to Transducer 12.52' BWL

Initial Pressure (P_i) 66.410'

Slug Level or Pressure (P_{max}) 64.063

Borehole Diameter 4"

Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement	Time Observed	Time Elapsed	Pressure Trans. Measurement
		SEE ATTACHED			SEE ATTACHED			

Recorded by JAMES A. COATES (Sign and Print Name) 11/22/91 (Date)

BD-6000-293 (07/90)

9413224.0251

WELL N-74 BASELINE FOR SLUG TESTS

p. 2 of 6

SE2000
Environmental Logger
11/04 15:40

Unit# 192 Test 3

INPUT 1: Level (F) TOC

Reference	66.410
SG	1.000
Linearity	0.000
Scale factor	9.998
Offset	0.000
Delay mSEC	50.000

Step 0 11/04 12:11:32

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft
0	0.0000	66.409	-66.409
1	0.0167	66.406	-66.406
2	0.0333	66.406	-66.406
3	0.0500	66.402	-66.402
4	0.0667	66.402	-66.402
5	0.0833	66.402	-66.402
6	0.1000	66.402	-66.402
7	0.1167	66.402	-66.402
8	0.1333	66.402	-66.402
9	0.1500	66.402	-66.402
10	0.1667	66.402	-66.402
11	0.1833	66.402	-66.402
12	0.2000	66.399	-66.399

p. 3 of 6

WELL N-74 SLUG INJECTION

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)

SE2000
Environmental Logger
11/04 15:38

Unit# 192 Test 4

INPUT 1: Level (F) TOC

Reference	66.410	
SG	1.000	
Linearity	0.000	
Scale factor	9.998	slugging rod vol. = 0.13 ft3
Offset	0.000	theoretical d(Yo) = 1.5 ft
Delay mSEC	50.000	

Step 0 11/04 12:24:39

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.0000	0.0000	64.063	-64.063	2.347	1.564666
0.0083	0.0001	64.284	-64.284	2.126	1.417333
0.0166	0.0003	67.821	-67.821	-1.411	-0.94066
0.0250	0.0004	65.222	-65.222	1.188	0.792
0.0333	0.0006	65.911	-65.911	0.499	0.332666
0.0416	0.0007	65.731	-65.731	0.679	0.452666
0.0500	0.0008	66.185	-66.185	0.225	0.15
0.0583	0.0010	66.160	-66.160	0.25	0.166666
0.0666	0.0011	66.280	-66.280	0.13	0.086666
0.0750	0.0013	66.293	-66.293	0.117	0.078
0.0833	0.0014	66.198	-66.198	0.212	0.141333
0.1000	0.0017	66.122	-66.122	0.288	0.192
0.1166	0.0019	66.182	-66.182	0.228	0.152
0.1333	0.0022	66.312	-66.312	0.098	0.065333
0.1500	0.0025	66.359	-66.359	0.051	0.034
0.1666	0.0028	66.362	-66.362	0.048	0.032
0.1833	0.0031	66.362	-66.362	0.048	0.032
0.2000	0.0033	66.372	-66.372	0.038	0.025333
0.2166	0.0036	66.359	-66.359	0.051	0.034
0.2333	0.0039	66.365	-66.365	0.045	0.03
0.2500	0.0042	66.375	-66.375	0.035	0.023333
0.2666	0.0044	66.378	-66.378	0.032	0.021333
0.2833	0.0047	66.381	-66.381	0.029	0.019333
0.3000	0.0050	66.381	-66.381	0.029	0.019333
0.3166	0.0053	66.384	-66.384	0.026	0.017333
0.3333	0.0056	66.387	-66.387	0.023	0.015333
0.4166	0.0069	66.391	-66.391	0.019	0.012666
0.5000	0.0083	66.394	-66.394	0.016	0.010666

WELL N-74 SLUG INJECTION

p. 4 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.5833	0.0097	66.397	-66.397	0.013	0.008666
0.6666	0.0111	66.400	-66.400	0.01	0.006666
0.7500	0.0125	66.400	-66.400	0.01	0.006666
0.8333	0.0139	66.400	-66.400	0.01	0.006666
0.9166	0.0153	66.403	-66.403	0.007	0.004666
1.0000	0.0167	66.403	-66.403	0.007	0.004666
1.0833	0.0181	66.406	-66.406	0.004	0.002666
1.1666	0.0194	66.406	-66.406	0.004	0.002666
1.2500	0.0208	66.406	-66.406	0.004	0.002666
1.3333	0.0222	66.406	-66.406	0.004	0.002666
1.4166	0.0236	66.406	-66.406	0.004	0.002666
1.5000	0.0250	66.406	-66.406	0.004	0.002666
1.5833	0.0264	66.406	-66.406	0.004	0.002666
1.6666	0.0278	66.410	-66.410	0	0
1.7500	0.0292	66.410	-66.410	0	0
1.8333	0.0306	66.410	-66.410	0	0
1.9166	0.0319	66.410	-66.410	0	0
2.0000	0.0333	66.410	-66.410	0	0
2.5000	0.0417	66.410	-66.410	0	0
3.0000	0.0500	66.413	-66.413	-0.003	-0.002
3.5000	0.0583	66.413	-66.413	-0.003	-0.002
4.0000	0.0667	66.413	-66.413	-0.003	-0.002
4.5000	0.0750	66.413	-66.413	-0.003	-0.002
5.0000	0.0833	66.413	-66.413	-0.003	-0.002
5.5000	0.0917	66.413	-66.413	-0.003	-0.002
6.0000	0.1000	66.413	-66.413	-0.003	-0.002
6.5000	0.1083	66.413	-66.413	-0.003	-0.002
7.0000	0.1167	66.413	-66.413	-0.003	-0.002
7.5000	0.1250	66.413	-66.413	-0.003	-0.002
8.0000	0.1333	66.413	-66.413	-0.003	-0.002
8.5000	0.1417	66.413	-66.413	-0.003	-0.002
9.0000	0.1500	66.413	-66.413	-0.003	-0.002
9.5000	0.1583	66.413	-66.413	-0.003	-0.002
10.0000	0.1667	66.413	-66.413	-0.003	-0.002
12.0000	0.2000	66.416	-66.416	-0.006	-0.004

WELL N-74 SLUG WITHDRAWAL

p. 5 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)

SE2000
Environmental Logger
11/04 15:35

Unit# 192 Test 5

INPUT 1: Level (F) TOC

Reference	66.410	
SG	1.000	
Linearity	0.000	
Scale factor	9.998	vol. slugging rod = 0.13 ft3
Offset	0.000	theoretical d(Yo) = 1.5 ft
Delay mSEC	50.000	

Step 0 11/04 12:38:43

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.0000	0.0000	66.953	-66.953	0.543	0.362
0.0083	0.0001	67.764	-67.764	1.354	0.902666
0.0166	0.0003	67.837	-67.837	1.427	0.951333
0.0250	0.0004	67.657	-67.657	1.247	0.831333
0.0333	0.0006	67.508	-67.508	1.098	0.732
0.0416	0.0007	67.360	-67.360	0.95	0.633333
0.0500	0.0008	67.237	-67.237	0.827	0.551333
0.0583	0.0010	67.126	-67.126	0.716	0.477333
0.0666	0.0011	67.035	-67.035	0.625	0.416666
0.0750	0.0013	66.956	-66.956	0.546	0.364
0.0833	0.0014	66.886	-66.886	0.476	0.317333
0.1000	0.0017	66.769	-66.769	0.359	0.239333
0.1166	0.0019	66.681	-66.681	0.271	0.180666
0.1333	0.0022	66.612	-66.612	0.202	0.134666
0.1500	0.0025	66.564	-66.564	0.154	0.102666
0.1666	0.0028	66.529	-66.529	0.119	0.079333
0.1833	0.0031	66.495	-66.495	0.085	0.056666
0.2000	0.0033	66.476	-66.476	0.066	0.044
0.2166	0.0036	66.463	-66.463	0.053	0.035333
0.2333	0.0039	66.451	-66.451	0.041	0.027333
0.2500	0.0042	66.441	-66.441	0.031	0.020666
0.2666	0.0044	66.432	-66.432	0.022	0.014666
0.2833	0.0047	66.428	-66.428	0.018	0.012
0.3000	0.0050	66.425	-66.425	0.015	0.01
0.3166	0.0053	66.419	-66.419	0.009	0.006
0.3333	0.0056	66.416	-66.416	0.006	0.004
0.4166	0.0069	66.410	-66.410	0	0
0.5000	0.0083	66.406	-66.406	-0.004	-0.00266

WELL N-74 SLUG WITHDRAWAL

p 6 of 6

Time:min	Time:hrs	D-T-W:Ft	d(WL):Ft	d(Y):Ft	d(Y)/d(Yo)
0.5833	0.0097	66.406	-66.406	-0.004	-0.00266
0.6666	0.0111	66.403	-66.403	-0.007	-0.00466
0.7500	0.0125	66.403	-66.403	-0.007	-0.00466
0.8333	0.0139	66.403	-66.403	-0.007	-0.00466
0.9166	0.0153	66.403	-66.403	-0.007	-0.00466
1.0000	0.0167	66.403	-66.403	-0.007	-0.00466
1.0833	0.0181	66.403	-66.403	-0.007	-0.00466
1.1666	0.0194	66.403	-66.403	-0.007	-0.00466
1.2500	0.0208	66.403	-66.403	-0.007	-0.00466
1.3333	0.0222	66.403	-66.403	-0.007	-0.00466
1.4166	0.0236	66.403	-66.403	-0.007	-0.00466
1.5000	0.0250	66.400	-66.400	-0.01	-0.00666
1.5833	0.0264	66.403	-66.403	-0.007	-0.00466
1.6666	0.0278	66.403	-66.403	-0.007	-0.00466
1.7500	0.0292	66.403	-66.403	-0.007	-0.00466
1.8333	0.0306	66.400	-66.400	-0.01	-0.00666
1.9166	0.0319	66.403	-66.403	-0.007	-0.00466
2.0000	0.0333	66.400	-66.400	-0.01	-0.00666
2.5000	0.0417	66.403	-66.403	-0.007	-0.00466
3.0000	0.0500	66.403	-66.403	-0.007	-0.00466
3.5000	0.0583	66.403	-66.403	-0.007	-0.00466
4.0000	0.0667	66.400	-66.400	-0.01	-0.00666
4.5000	0.0750	66.400	-66.400	-0.01	-0.00666
5.0000	0.0833	66.403	-66.403	-0.007	-0.00466
5.5000	0.0917	66.403	-66.403	-0.007	-0.00466
6.0000	0.1000	66.403	-66.403	-0.007	-0.00466
6.5000	0.1083	66.403	-66.403	-0.007	-0.00466
7.0000	0.1167	66.403	-66.403	-0.007	-0.00466
7.5000	0.1250	66.403	-66.403	-0.007	-0.00466
8.0000	0.1333	66.403	-66.403	-0.007	-0.00466
8.5000	0.1417	66.403	-66.403	-0.007	-0.00466
9.0000	0.1500	66.400	-66.400	-0.01	-0.00666
9.5000	0.1583	66.403	-66.403	-0.007	-0.00466
10.0000	0.1667	66.400	-66.400	-0.01	-0.00666

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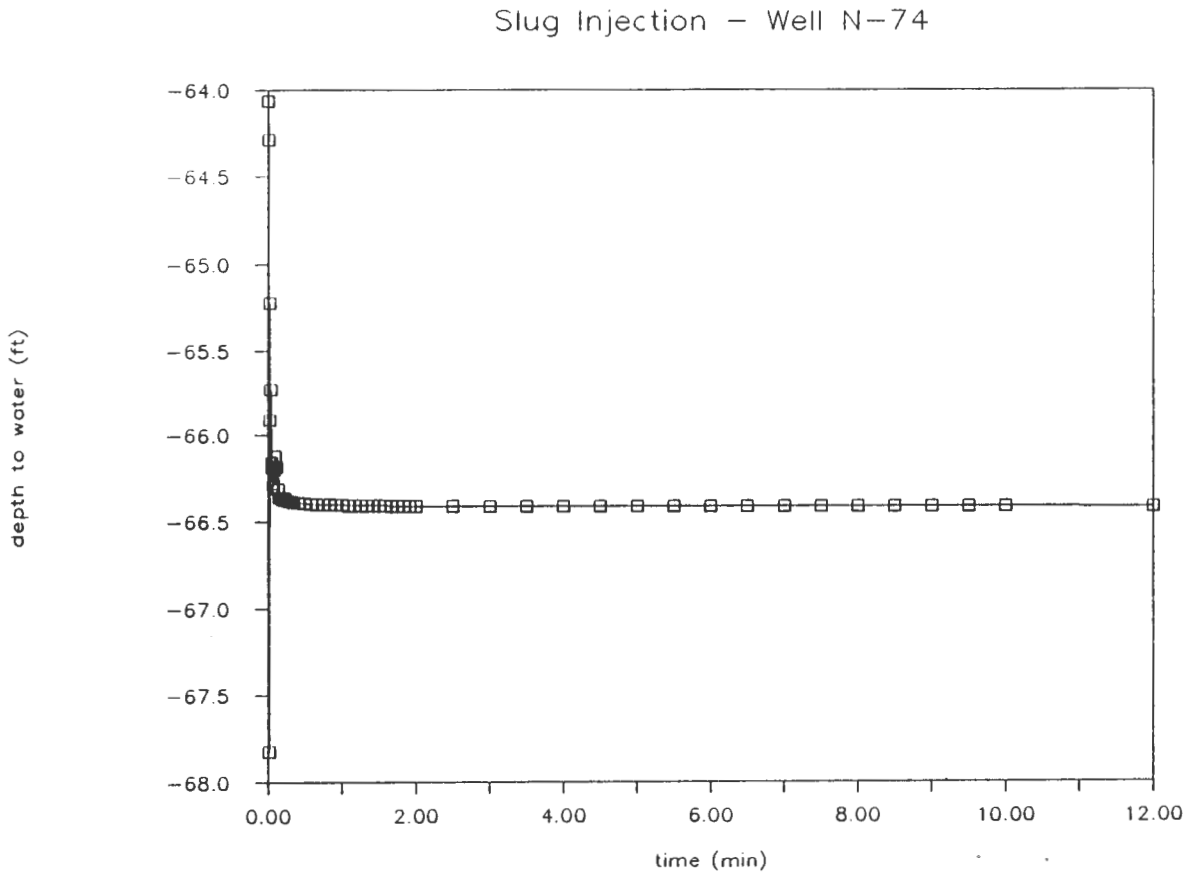
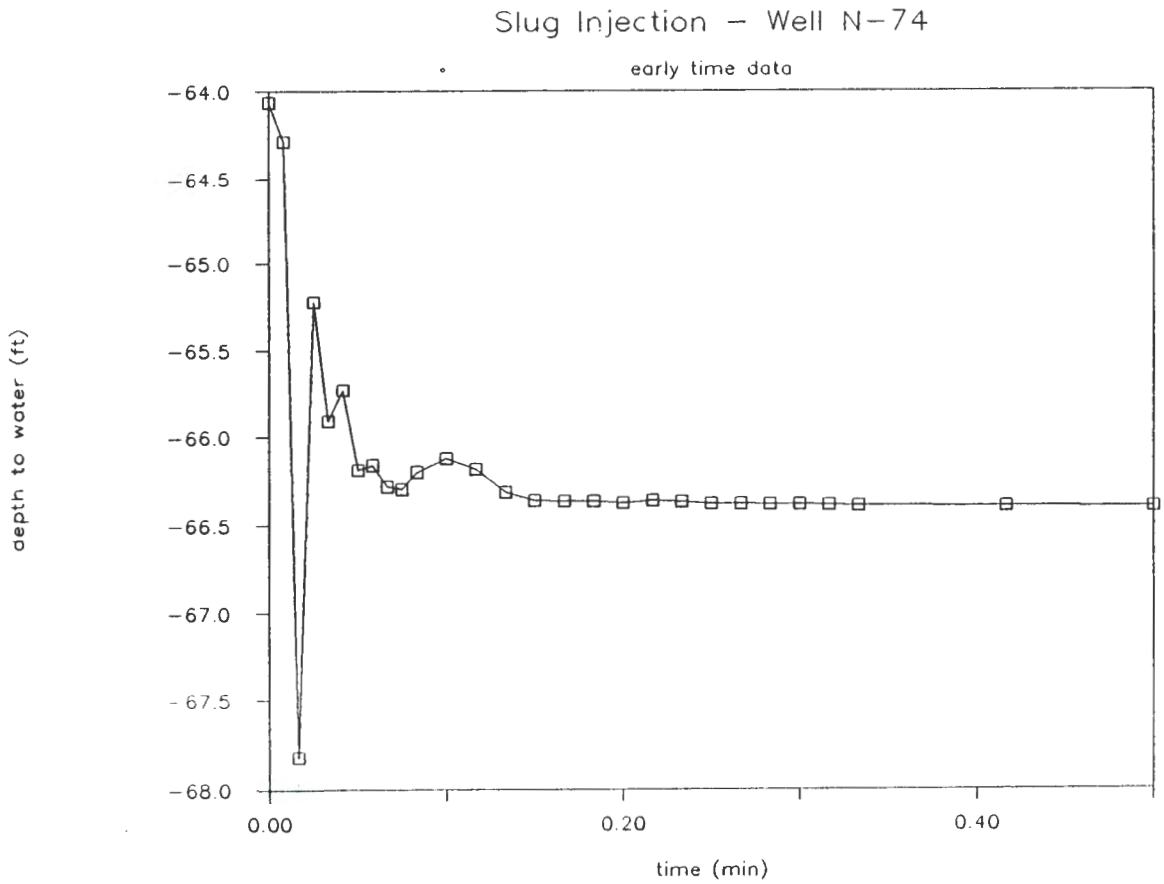
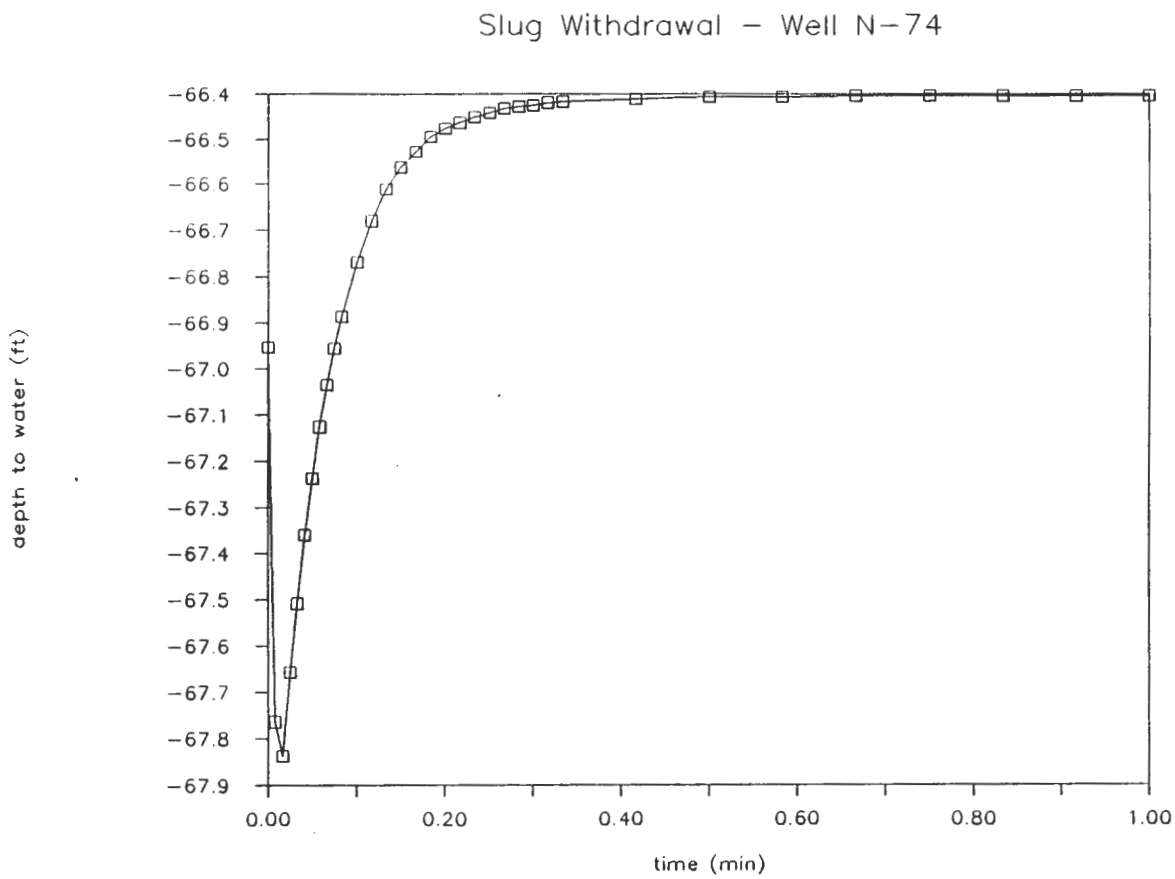
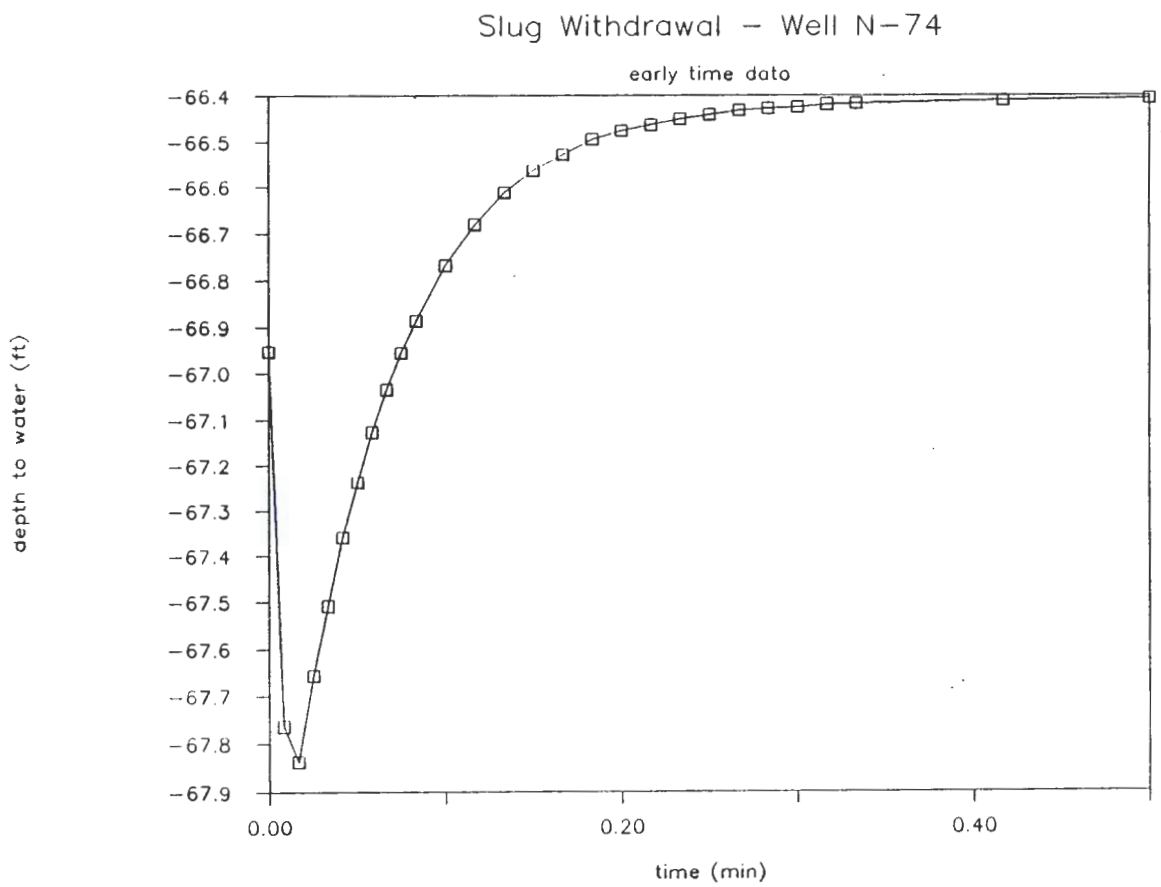

Slug Injection - Well N-74
depth to water (ft)
-64.0
-64.5
-65.0
-65.5
-66.0
-66.5
-67.0
-67.5
-68.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
time (min)


Slug Injection - Well N-74
early time data
depth to water (ft)
-64.0
-64.5
-65.0
-65.5
-66.0
-66.5
-67.0
-67.5
-68.0
0.00
0.20
0.40
time (min)


Slug Withdrawal - Well N-74
depth to water (ft)
-66.4
-66.5
-66.6
-66.7
-66.8
-66.9
-67.0
-67.1
-67.2
-67.3
-67.4
-67.5
-67.6
-67.7
-67.8
-67.9
0.00
0.20
0.40
0.60
0.80
1.00
time (min)


Slug Withdrawal - Well N-74
early time data
depth to water (ft)
-66.4
-66.5
-66.6
-66.7
-66.8
-66.9
-67.0
-67.1
-67.2
-67.3
-67.4
-67.5
-67.6
-67.7
-67.8
-67.9
0.00
0.20
0.40
time (min)

199-N-74 Slug Withdrawal Calculations

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

RADIUS OF CASING USED IN CALCULATIONS HAS BEEN
CORRECTED FOR THE THICKNESS OF GRAVEL OR SAND
PACK DUE TO WATER LEVEL CHANGES IN THE SCREEN OR
OPEN INTERVAL OF WELL.

****

r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)	H (ft)
.2298	.3330	17.7000	17.7000	40.0000

****

L_e/r_w = 53.1531600
A= 3.1869620
B= 5.220909E-001
C= 2.8209920
SANDPACK POROSITY= 3.000000E-001
t (min)= 1.000000E-001
1/t= 10.0000000
Y_o= (ft) 1.9000000
Y_t= (ft) 3.500000E-001
$1/t \ln(Y_o/Y_t)$= 16.9167600
$\ln[(H-L_w)/r_w]$= 4.2041990
$\ln(r_e/r_w)$= 2.6447340

****

K (ft/day) = 96.0730900

****

T OF THE SATURATED SCREEN INTERVAL
(ft^2/day)= 1700.4940000

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